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Sierra 128A

FREQUENCY SELECTIVE VOLTMETER

OPERATION/MAINTENANCE MANUAL

SMM-128A

ISSUE 1

1803 – 2012

PHILCO Ford

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3885 Bohannon Drive
Menlo Park, California . 94025
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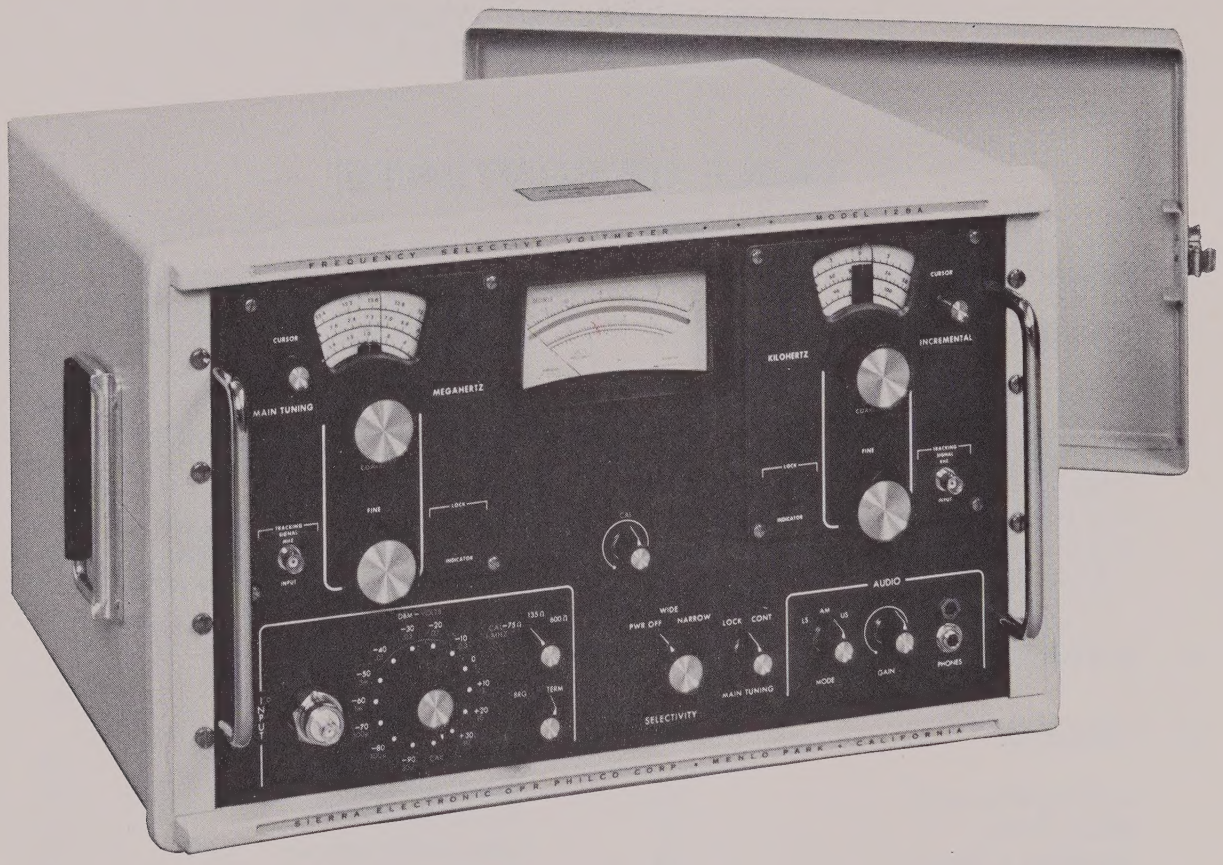
128A FREQUENCY SELECTIVE VOLTMETER
OPERATION AND MAINTENANCE

TABLE OF CONTENTS

	CONTENTS	PAGE
1.	GENERAL INFORMATION	1-1
2.	PHYSICAL DESCRIPTION	2-1
3.	FUNCTIONAL DESCRIPTION	3-1
	Signal Channel	3-1
	Tuning	3-1
	Main Tuning and Frequency Lock Circuits	3-3
	Incremental Tuning and Frequency Lock Circuits	3-3
4.	SPECIFICATIONS	4-1
5.	OPERATION	5-1
	Receiving Information	5-1
	Primary Power	5-1
	Operational Calibration	5-1
	Operational Measurements	5-2
6.	CIRCUIT DESCRIPTION	6-1
	Signal Channel	6-1
	Input Matching and Attenuator Circuit	6-1
	Preamplifier	6-1
	Input Lowpass Filter	6-1
	First Mixer, First Modulator and First IF	6-1
	Second Mixer and Second Modulator	6-2
	Second IF Amplifier	6-2
	Meter Output Amplifiers and Rectifier	6-2
	Audio Amplifier and Detector	6-2
	Carrier Reinsertion Oscillators (On Audio Circuit Board)	6-2
	Gain Reference Oscillator	6-3
	Main Tuning and Frequency Lock Circuits	6-3
	Main Tuning Oscillator	6-3
	100 kHz Oscillator and Harmonic Generator	6-3
	Main Tuning Mixer	6-3
	Amplifier Detector, Lowpass Filter and Main Lock Indicator	6-4
	Incremental Tuning and Frequency Lock Circuits	6-4
	Incremental Tuning Oscillator and First IF Amplifier	6-4
	Second Oscillator	6-6
	Incremental Referene Oscillator and Mixer, and Second LF Amplifier	6-6
	Phase Discriminator and Lowpass Filter	6-6
	Incremental Lock Indicator	6-6
	Power Supply Circuits	
7.	MAINTENANCE	7-1
	Operator Maintenance	7-1
	Operational Calibration	7-1
	Fuse Replacement	7-1
	Corrective Maintenance	7-1
	General Specification Check	7-3
	75 Ohm Input Impedance	7-3
	135 Ohm Input Impedance	7-3
	600 Ohm Input Impedance	7-3
	Direct First IF Response	7-7
	Direct Second IF Response	7-8
	Residual Distortion Attenuation	7-8
	AM Check	7-8
	SSB Check	7-8
	Alignment and Calibration	7-8
	110 kHz Bandpass Check	7-10
	First Modulator	7-11
	Second Modulator	7-11
	Main Tuning Oscillator, Locking and Tracking	7-12
	Incremental Tuning Oscillator, Locking and Tracking	7-16
	Tracking With Sierra 351A Signal Generator	7-22
8.	REPLACEABLE PARTS LIST	8-1



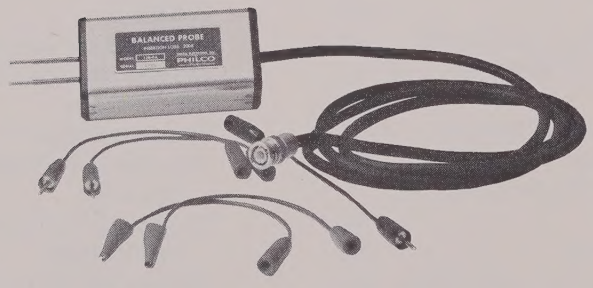


Figure 1-1. Sierra 128A Frequency Selective Voltmeter shown with Sierra 128-PA Balanced Probe Accessory

SECTION 1
GENERAL INFORMATION

1.01 This maintenance manual describes the Sierra 128A Frequency Selective Voltmeter (Figure 1-1) and contains instructions on how to use and maintain it. Included are physical, functional, and circuit descriptions; specifications; operation and maintenance information; alignment and calibration procedures; and a list of replaceable parts.

1.02 The 128A features a high degree of accuracy and sensitivity for measuring signals between 4 kHz and 15.2 MHz. Single range tuning and a crystal-controlled frequency source with phase-lock circuitry combine to provide fast, precise carrier measurements, bandpass measurements and wave analysis. The instrument is useful in measuring crosstalk, distortion, attenuation, random noise level, modulation on AM or SSB systems, pilot tones, carrier levels and other complex signals on high density communications systems. The high selectivity of the 128A permits the carrier frequency to be measured separately from sideband frequencies when normal channel spacing is used. Either a narrow or wide bandwidth is available in the 128A. Since the instrument may be operated from either an ac or battery power source, it is readily adaptable for use in the field, at a communications terminal, or in the laboratory.

1.03 The Sierra 128-PA Balanced Probe is available as an accessory for applications requiring a balanced input to the 128A Voltmeter.

1.04 The Sierra 360B Spectrum Display Unit expands the capability of the 128A when checking cumbersome high-density systems. The spectrum display unit is a high-resolution, swept-display instrument for visual observation of up to 30 voice channels at a time. In this way it is possible to scan the entire baseband quickly and efficiently. Any signal may be identified for further measurement and analysis by the Sierra 128A.

SECTION 2
PHYSICAL DESCRIPTION

2.01 The Sierra 128A is housed in a ruggedized case with front cover to protect the instrument in normal field applications. It measures 12 inches high, 20-5/8 inches wide, 17-5/8 inches deep, and weighs approximately 65 pounds.

2.02 The Sierra 128A is a fully transistorized instrument employing modular circuit boards for component mounting. To provide adequate shielding for low level signals and stability of operation of the frequency generating sections, four aluminum castings are used to enclose a large part of the instrument circuitry. The castings are internally divided into compartments, each of which contains a circuit board assembly. This construction provides a high degree of isolation between circuits. The remainder of the circuit board assemblies are mounted on the chassis or the front panel. Shielded compartments are also used for these circuits where necessary.

2.03 Front panel controls and indicators are shown in Figure 2-1 and identified in Table 2-1. Rear panel connectors and fuses are shown in Figure 2-2 and identified in Table 2-2.

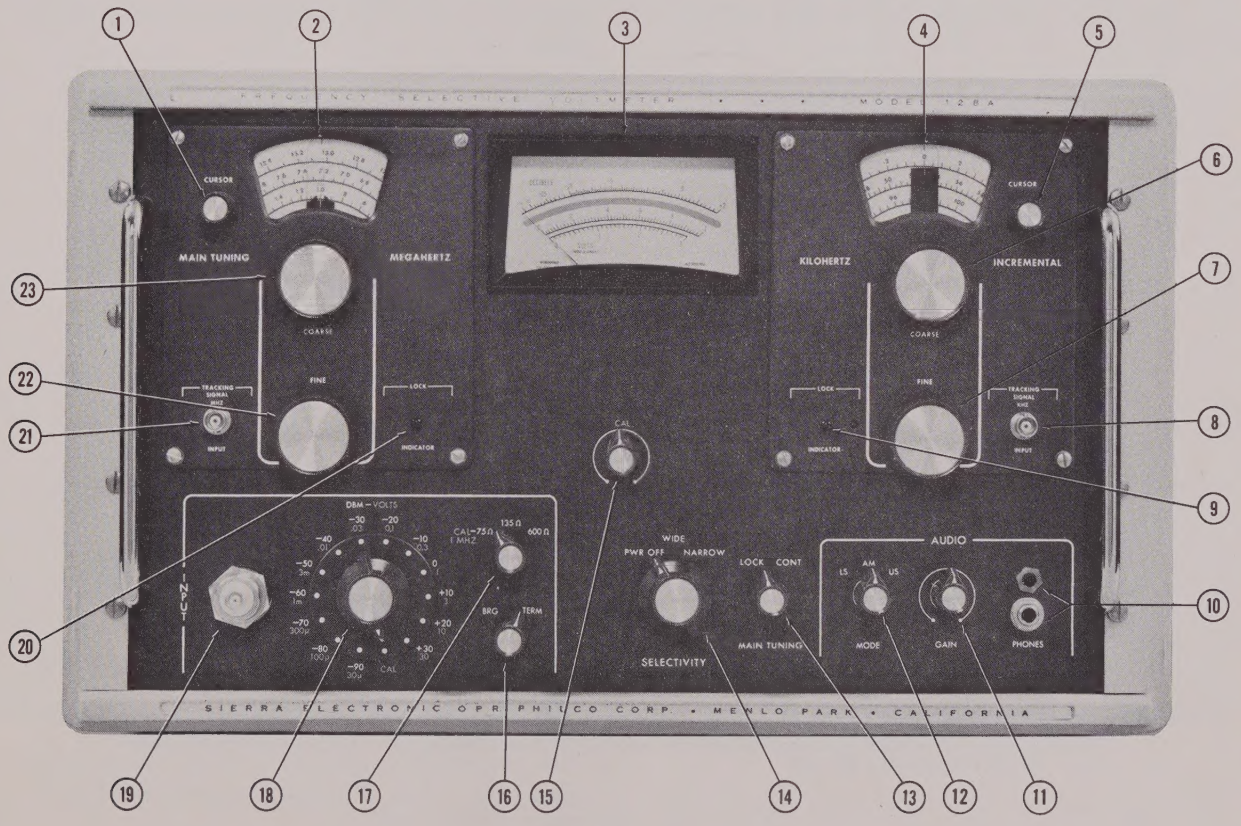


Figure 2-1. Sierra 128A Front Panel Controls and Indicators

Table 2-1. Sierra 128A Front Panel Controls and Indicators

INDEX NO.	NAME	FUNCTION
1	CURSOR Knob	Adjusts main tuning cursor pointer to exact calibrated position.
2	Main Tuning Dial	Indicates tuned frequency in MHz.
3	Meter	Indicates signal level in volts or dBm.
4	Incremental Tuning Dial	Indicates incremental tuned frequency in kHz.
5	CURSOR Knob	Adjusts incremental tuning cursor pointer to exact calibrated position.
6	COARSE Tuning Knob	Tunes incremental oscillator -10 to +100 kHz around frequency selected on Main Tuning Dial.
7	FINE Tuning Knob	Fine tunes incremental oscillator.
8	TRACKING SIGNAL KHZ INPUT	Input connector for kHz signal from external Tracking Signal Generator.
9	LOCK INDICATOR Lamp	Indicates incremental frequency locking.
10	PHONES Jacks	Jacks for headphone monitoring.
11	GAIN Control	Adjusts loudness of audio signal.
12	MODE Control	Selects AM, lower sideband, or upper sideband reception.
13	MAIN TUNING Mode Selector	Selects continuous tuning or frequency lock tuning mode.
14	SELECTIVITY Control	Selects wide band or narrow band reception, power on-off switch.
15	CAL Control	Adjusts gain of instrument when input attenuator is in CAL position.
16	BRG/TERM	Selects bridging or termination input mode.
17	Impedance Selector	Selects terminating impedance of 75, 135 or 600 ohms. Also indicates calibration position (CAL 1 MHz)
18	Input Attenuator Switch	Selects amount of attenuation for correct meter reading of input signal level. Markings correspond to full scale values in dBm or volts.

Table 2-1. Sierra 128A Front Panel Controls and Indicators (Cont)

INDEX NO.	NAME	FUNCTION
19	Signal Input Connector	Connector with BNC fitting for signal input to instrument.
20	LOCK INDICATOR Lamp	Indicates frequency lock condition of main tuning oscillator.
21	TRACKING SIGNAL MHZ INPUT	Input connector for MHz signal from external Tracking Signal Generator.
22	FINE Tuning Knob	Fine adjustment for main tuning oscillator.
23	COARSE Tuning Knob	Coarse tunes main oscillator over range of 4 kHz to 15.2 MHz.

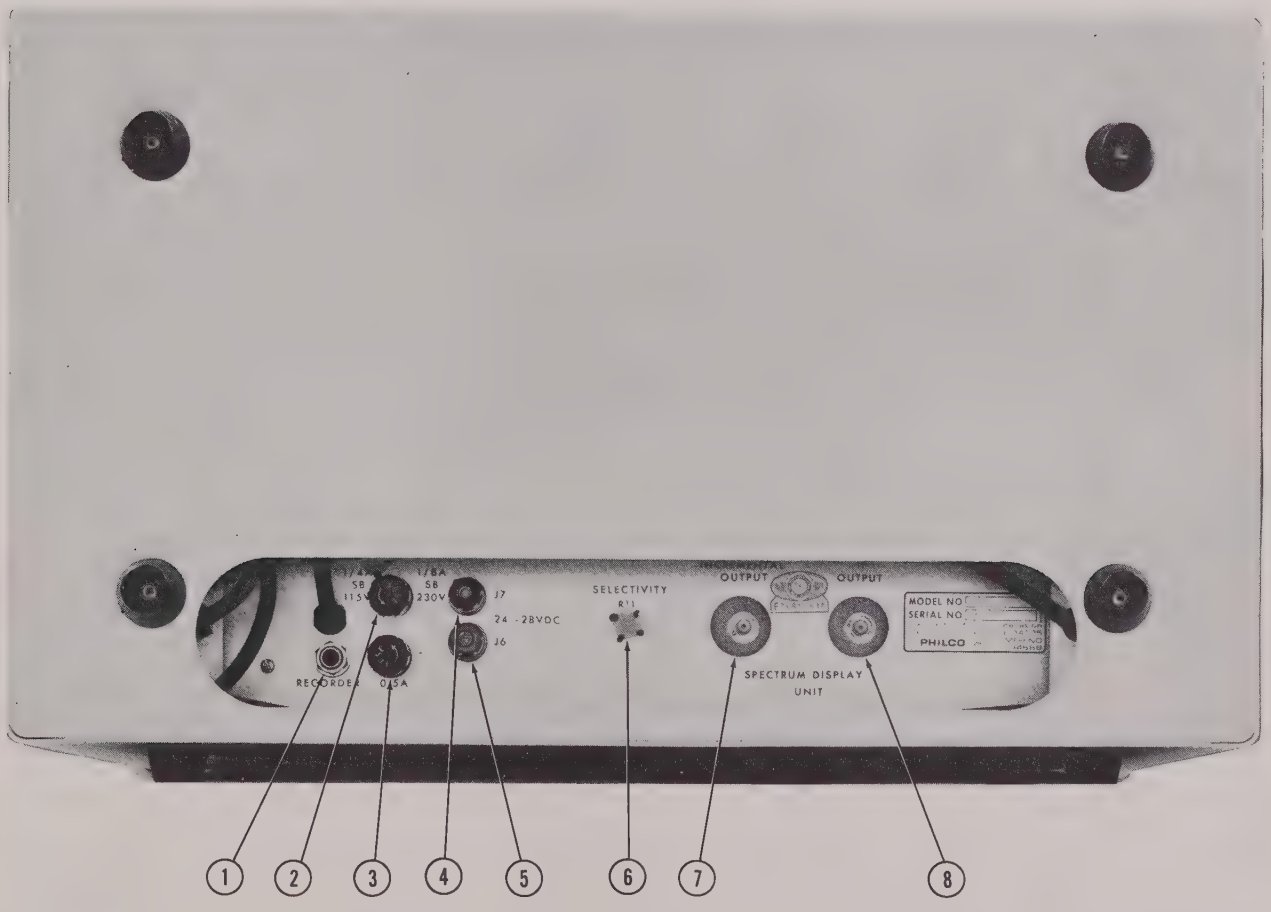


Figure 2-2. Sierra 128A Rear Panel Connectors and Fuses

Table 2-2. Sierra 128A Rear Panel Connectors and Fuses

INDEX NO.	NAME	FUNCTION
1	RECORDER Jack	Provides output signal for operation of external recorder.
2	Fuse Holder, 1/4A SB 115V, 1/8A SB 230V	Fuse holder for fuse F1 in primary power input, 115/230 Vac line.
3	Fuse Holder 0.5A	Fuse holder for fuse F2 used in dc side of power supply.
4	J7 Jack	Banana jack input for negative side of external 24-28 Vdc power supply (battery).
5	J6 Jack	Banana jack input for positive side of external 24-28 Vdc power supply (battery).
6	SELECTIVITY R11	Access hole with cover for internal adjustment of R11, SELECTIVITY. Used only by maintenance activities in alignment and calibration of instrument.
7	INCREMENTAL OUTPUT Connector	Provides incremental signal for use with external Spectrum Display Unit.
8	IF OUTPUT Connector	Provides IF signal for use with external Spectrum Display Unit.

SECTION 3
FUNCTIONAL DESCRIPTION

3.01 The Sierra 128A Frequency Selective Voltmeter measures signals between 4 kHz and 15.2 MHz with a high degree of accuracy and sensitivity. The 128A may be compared roughly to a double conversion superheterodyne receiver but with the primary function of accurately measuring the frequency and level of a received signal instead of extracting intelligence from it. The main tuning oscillator provides the first conversion of the signal frequency to an IF of 21 MHz. The incremental oscillator provides the next conversion to the second IF of 2.215 MHz. Appropriate filters and detectors along with gain stabilization and calibration circuitry are included to fulfill the functions of a frequency selective voltmeter. Phase lock oscillator circuitry provides precise frequency measurements.

3.02 The 128A circuitry is divided into three principal sections: the signal channel, the main tuning and frequency lock circuits, and the incremental tuning and frequency lock circuits. Front panel controls are divided into similar groupings. Refer to the Functional Block Diagram, Figure 3-1 for relationships of the various circuits.

SIGNAL CHANNEL

3.03 Input circuits of the 128A may be set for either a terminating or a bridging mode. The terminating mode provides a termination impedance of 75, 135 or 600 ohms. In the bridging mode the input impedance is sufficiently high, approximately 100,000 ohms, to ensure a low bridging loss.

3.04 The input attenuator is adjustable in 10 dB steps and is calibrated from -90 dBm to +30 dBm, representing the full scale deflection of the front panel readout meter. The attenuator is also calibrated in volts, the panel scale range being from 30 microvolts to 30 volts. To measure voltage the input must be set to the 600 ohm position. The minimum level of readability of the meter extends down to -100 dBm and to 3 microvolts.

3.05 Operational calibration of the instrument is provided by an internal gain reference oscillator. The output of this 1 MHz crystal-controlled oscillator is highly stabilized.

3.06 From the input matching and attenuator circuits the signal passes through a wide band preamplifier and the input lowpass filter to the first mixer. The main tuning oscillator output frequency of 21.1 to 36.1 MHz is applied to the first modulator and then to the first mixer. It is here that it is mixed with the received signal. The difference frequency of 21.05 MHz is the first intermediate frequency (IF) which then goes through a steep-skirted bandpass filter to the second mixer.

3.07 In the second mixer the first IF signal of 21.05 MHz is combined with the 18.785-18.895 MHz output frequency of the incremental tuning second oscillator. The resulting difference frequency of 2.215 MHz is the second IF which is fed to the second IF amplifier. From there the signal is fed to the IF buffer stages which separate the signal into two parallel paths for the narrow band and wide band crystal filters. The narrow band filter has a bandwidth of 250 Hz and the wide band filter has a bandwidth of 3100 Hz. These filters determine the overall selectivity of the voltmeter.

3.08 The narrow band or wide band filters are selected by a front panel SELECTIVITY control and the signal is sent to an output amplifier, meter rectifier, and the front panel meter. A closed circuit RECORDER jack is in series with the meter circuit providing a recorder output. The wideband filter also is permanently connected through an audio detector and amplifier to a headphone output jack. In addition to AM reception, carrier reinsertion oscillators permit reception of either upper or lower sideband signals.

3.09 A stabilized gain reference oscillator is energized when the INPUT attenuator is placed in the CAL position providing a 1 MHz square wave for level calibration of the voltmeter. This calibration sets the gain of the instrument so that meter readings are accurate. Level calibration must be carried out only at the 1 MHz frequency. The square wave is rich in harmonics so that frequency check points are available at 1 MHz intervals over the range of the instrument.

TUNING

3.10 The 128A may be tuned either continuously or frequency locked every 100 kHz. Frequency lock is indicated by a panel lamp. For frequencies between the 100-kHz points the incremental oscillator is used. To provide accuracy over the full frequency range, a two-dial tuning technique is used. The MAIN TUNING dial is calibrated in 100-kHz steps from 0 to 15 MHz. The

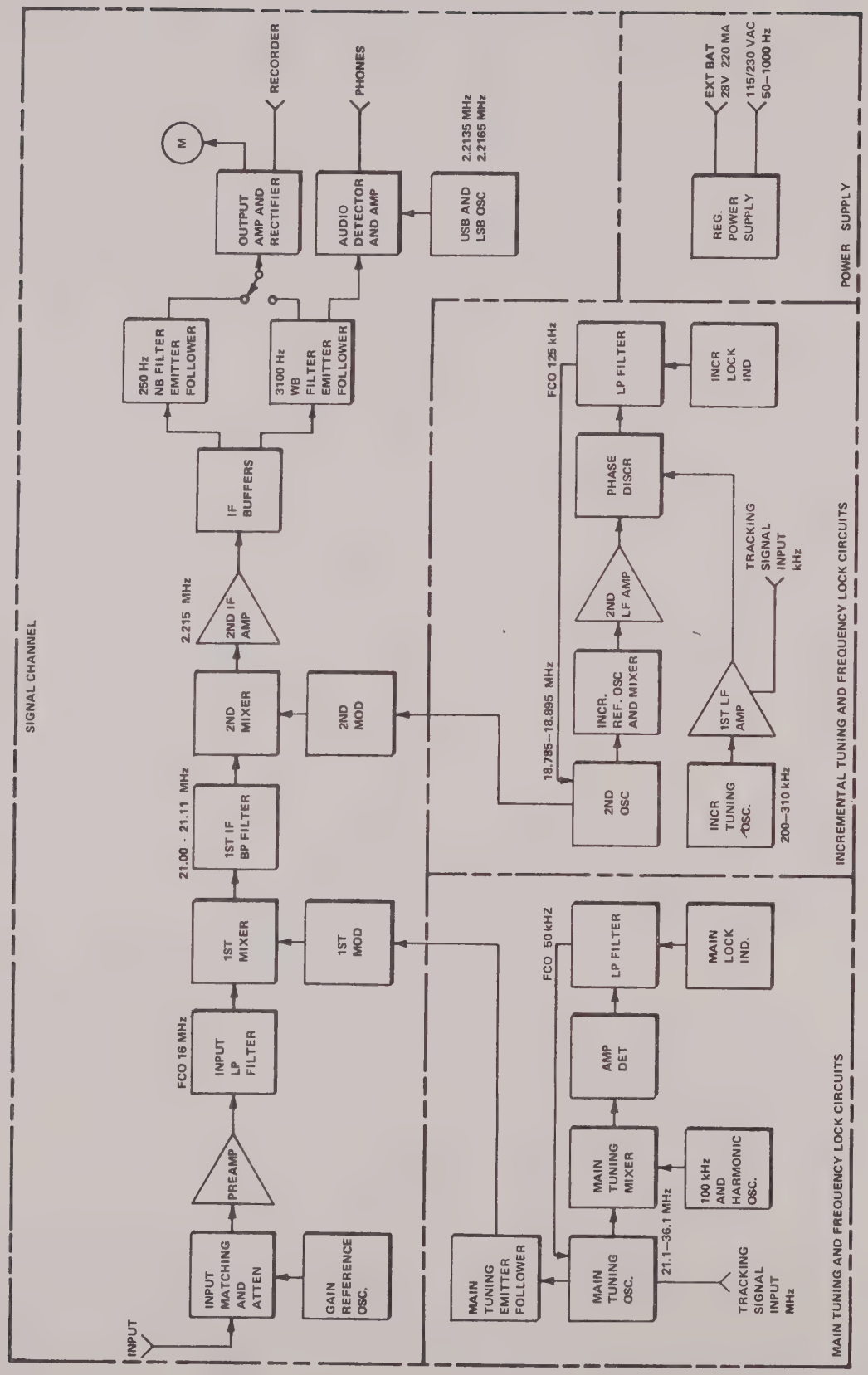


Figure 3-1. Sierra 128A Functional Block Diagram

INCREMENTAL dial tunes from −10 to 100 kHz, with scale marks every 500 Hz. The tuned frequency is the sum of the two readout dials.

3.11 Dial drives of both oscillators have COARSE and FINE tuning controls. The dial calibrations are on a spiral scale and a cursor index automatically moves to indicate the proper reading point on the dial. This provides a long scale with widely spaced scale divisions.

3.12 Both dials are fitted with a cursor adjustment as a front panel control. The index on the cursor may be set to the proper point on the dial scale using the internal one MHz gain reference oscillator.

3.13 To provide for synchronous tuning of the 128A by means of a Tracking Signal Generator (Sierra 351A), input BNC connectors are mounted on the dial panels of both the main tuning oscillator and the incremental tuning oscillator. When connected, the Tracking Signal Generator takes the place of the main tuning oscillator and the incremental tuning oscillator. Control dc voltage from the Tracking Signal Generator actuates a relay within the 128A disabling the internal oscillator circuits and switching the tuning frequency control to the external generator. Tuning frequencies are fed to the stages shown in the Functional Block Diagram, Figure 3-1.

MAIN TUNING AND FREQUENCY LOCK CIRCUITS

3.14 The main tuning oscillator uses a highly stabilized Colpitts circuit and is tuned by the MAIN TUNING capacitor over the range 21.1 MHz to 36.1 MHz. It may be operated in a locked or continuous mode as selected by front panel switch S5.

3.15 In the locked mode the oscillator is locked on frequency every 100 kHz over its full range by means of an error voltage applied to the varactor diode shunted across the main oscillator tuning capacitor. This error voltage causes the diode to change its effective capacity in such a direction that the main oscillator is maintained in harmonic relationship with the 100 kHz oscillator over a narrow tuning range around each 100 kHz harmonic point. Generation of the error voltage is accomplished in the frequency lock circuitry consisting of the 100 kHz oscillator and harmonic generator, the main tuning mixer, the amplifier detector, lowpass filter, and main lock indicator.

3.16 In the continuous mode the frequency lock circuitry is disabled and a fixed bias is applied to the varactor diode. Under these conditions the voltmeter frequency can be tuned continuously over its range with the MAIN TUNING control. The frequency is indicated by the MAIN TUNING dial.

INCREMENTAL TUNING AND FREQUENCY LOCK CIRCUITS

3.17 Adjustment of the 128A to frequencies between the 100 kHz harmonic points selected by the main tuning oscillator control is accomplished with the incremental tuning oscillator. This is a very stable Clapp oscillator covering the frequency range of 200 kHz to 310 kHz tuned by the front panel mounted capacitor. Tuning dial calibration is from −10 to 0 to 100 kHz, providing a range that overlaps the 100 kHz lock points of the main tuning oscillator.

3.18 To make the frequency conversion from the first IF band of 21.000-21.110 MHz to the second IF of 2.215 MHz, the second oscillator tunes over the range of 18.785-18.895 MHz. Tuning is accomplished solely by means of a varactor diode. Adjusting the incremental tuning oscillator indirectly causes the voltage to change across the varactor diode, providing exact control of the second oscillator frequency. The dc voltage change across the diode is accomplished by the incremental reference oscillator and mixer, the second low frequency (LF) amplifier, the phase discriminator and lowpass filter. Phase locking takes place and the incremental tuning oscillator maintains exact control over the second oscillator.

SECTION 4
SPECIFICATIONS

4.01 The Sierra 128A Frequency Selective Voltmeter specifications are given in Table 4-1.

4.02 Specifications for the Sierra 128-PA Balanced Probe are given in Table 4-2.

Table 4-1. Sierra 128A Specifications

PARAMETER	CHARACTERISTIC
Frequency Range (4-10 kHz measurements in narrowband mode only)	4 kHz to 15.2 MHz
Main Tuning	
Locked, in 100-kHz steps	0, 100, 200 kHz – 15.1 MHz
Unlocked, continuous	0 to 15.2 MHz
Incremental Tuning	
Continuous	–10 to 100 kHz
Minimum Reading Increment	500 Hz
Accuracy, lock system actuated (at room temperature)	10 ppm ±300 Hz
Input Level Range	
dBm (75, 135, 600 ohms)	–100 to +32 dBm
Voltage (600 ohms only)	3 μvolts to 30 volts
Measurement Accuracy	
At reference of 1 MHz and 0 dBm level	±0.2 dB
Frequency response referred to 1 MHz in attenuator position –70 to +30 dB	
100 kHz to 10 MHz	±0.2 dB
10 kHz to 15 MHz	±0.5 dB
in attenuator positions –90 and –80 dB	
10 kHz to 10 MHz	±0.5 dB
10 MHz to 15 MHz	±0.7 dB
Attenuator Accuracy Referred to 0 dBm	
–90 dB to +30 dB	
100 kHz to 1 MHz	±0.1 dB
10 kHz to 5 MHz	±0.2 dB
5 MHz to 10 MHz	±0.3 dB
10 MHz to 15 MHz	±0.8 dB
–70 dB to +20 dB	
5 MHz to 10 MHz	±0.2 dB
10 MHz to 15 MHz	±0.3 dB
±10% Line Voltage	±0.1 dB

Table 4-1. Sierra 128A Specifications (Cont)

PARAMETER	CHARACTERISTIC
Input Impedance	
Bridging Mode	Unbalanced
Resistance	Greater than 100 K ohms
Capacitance	
−60 to +30 dB	30 pf
−90 to −70 dB	60 pf
Terminating Mode	75, 135, 600 ohms
Reflection Coefficient	5%
Selectivity	
Wide Bandwidth	
3 dB	3100 ±200 Hz (3-dB points)
60 dB	8000 +500 Hz − 1000 Hz (60-dB points)
Narrow Bandwidth	
3 dB	250 ±50 Hz (3-dB points)
60 dB	1000 ±100 Hz (60-dB points)
Spurious Response	
Image Frequency Rejection (42 to 57 MHz)	70 dB down
Residual Distortion Attenuation	65 dB
Audio Monitor	Continuous operation independent of bandwidth mode
Audio Output	(600-ohm minimum impedance) Phones
Recorder Output	
Level (maximum)	200 μa
Connector	Telephone jack
Power Requirements	
Line Power	115 or 230 volts ac ±10%, 15 VA
External Battery	24-28 volts dc, 230 mA
Overall Dimensions (cabinet)	
Width	20-5/8 inches (524 mm)
Height	12 inches (305 mm)
Depth	17-5/8 inches (448 mm)
Dimensions	
Width	19 inches (483 mm)
Height	10-1/2 inches (267 mm)
Depth	14 inches (356 mm)
Weight (in cabinet)	65 pounds, approx. (29.45 kg)
Temperature Range	+59°F to +104°F (+15°C to +40°C)

Table 4-2. Sierra 128-PA Balanced Probe Specifications

PARAMETER	CHARACTERISTIC	
Circuit Impedance	135 ohms	600 ohms
Frequency Range	10 kHz to 3.5 MHz	10 kHz to 1.5 MHz
Insertion Loss	20 dB ±0.25 dB	20 dB ±0.25 dB
Bridging Loss	0.1 dB	0.3 dB up to 620 kHz 0.4 dB up to 1.5 MHz
Input Impedance		
Bridging		
At 1 MHz	13K ohms in parallel with 18 pf	
At 3.5 MHz	8K ohms in parallel with 20 pf	
Terminating Mode		
135 ohm	Reflection coefficient less than 2%	
600 ohm	Reflection coefficient less than 4%	
Maximum Input Level	+20 dBm	
Minimum Input Level	−90 dBm	

SECTION 5
OPERATION

RECEIVING INFORMATION

5.01 When the Voltmeter is received, unpack it, and inspect it carefully. Retain the shipping carton. Check the equipment received against the order. If the instrument is damaged or does not operate properly, contact the nearest Sierra regional manager or the Customer Service Department of Sierra Electronic Operation.

ADDRESS: Customer Service Department
Sierra Electronic Operation
Philco-Ford Corporation
3885 Bohannon Drive
Menlo Park, California 94025
Phone: (415) 322-7222
TWX: 910-373-1282

NOTE: Do not repackage damaged or faulty equipment for reshipment to Sierra Electronic Operation under the provisions of the Warranty without first contacting the Customer Service Department for specific instructions.

PRIMARY POWER

5.02 Input power to the 128A may be either 115 volts ac, 230 volts ac, or 24-28 volts dc. As shipped the standard instrument is connected to operate on 115 volt ac input power. For 230 Vac operation perform the following:

Step 1
Disconnect jumpers from pin 1 to pin 3 and from pin 2 to pin 4 on power supply board, part number B02051200.

Step 2
Connect jumper between pin 2 and pin 3 on power supply board.

NOTE: Mark power cable "for 230V Operation Only".

Step 3
Replace the 0.25 amp slow-blow fuse (F1) at the rear of the chassis with a 0.125 amp slow-blow fuse.

The 128A also may be operated from a dc voltage source of 24-28 volts (usually a battery). The positive side should be connected to J6, a red banana jack on the rear panel. The negative side should be connected to J7, the adjacent black banana jack.

OPERATIONAL CALIBRATION

5.03 The Operational Calibration sets the overall sensitivity of the voltmeter for all of its ranges. The highly stabilized Gain Reference Oscillator, the output of which is nominally within ±0.1 dB under room ambient conditions, is used as the standard. (Level calibration must be carried out at the 1 MHz frequency only.) Procedure follows:

Step 1
Set INPUT DBM-VOLT attenuator to CAL. (Full clockwise rotation.)

Step 2
Set INPUT Impedance Selector to CAL-75Ω.

Step 3
Set SELECTIVITY swtich to NARROW.

Step 4
Place FUNCTION MAIN TUNING Mode selector in LOCK position.

Step 5
Set MAIN TUNING MEGAHERTZ dial to 1 MHz (LOCKED light will come on to indicated frequency locked condition).

Step 6
Set INCREMENTAL KILOHERTZ dial to 0 and carefully adjust tuning for maximum meter reading.

Step 7
Adjust CAL control until meter reads 0 dBm.

Step 8
If necessary set the cursor index directly over 0 mark on INCREMENTAL Tuning dial using CURSOR adjustment. If it is desired to set cursor on MAIN TUNING dial, set the dial, in the locked condition at 1 MHz, or any harmonic, so that it is half way between the points at which it goes out of lock. With the CURSOR adjustment, set index directly under the 1 MHz scale division mark, or at any of the harmonics of 1 MHz.

OPERATIONAL MEASUREMENTS

5.04 Measurements are made with the 128A in accordance with the following procedure:

Step 1
INPUT DBM-VOLTS attenuator should be turned full clockwise to +30 dBm, or CAL, before connection is made to line or circuit, as a precautionary measure.

Step 2
Perform Operational Calibration as outlined in Paragraph 5.03.

Step 3
Set INPUT impedance selector to the impedance of line or circuit to be checked, or to 600Ω if voltage is to be measured.

Step 4
Set INPUT mode selector to BRG if measurement is to be made across a line or circuit already terminated. Set to TERM if the line must be terminated in its characteristic impedance.

Step 5
If frequency of desired signal is known:

(a) Set SELECTIVITY switch to WIDE.

(b) Set FUNCTION MAIN TUNING mode selector to LOCK.

(c) Set INPUT DBM-VOLTS attenuator to approximately the expected signal level.

(d) Set INCREMENTAL tuning dial to 0 kHz.

(e) Set the MAIN TUNING frequency dial to the nearest 100 kHz lock point below the signal frequency.

(f) Adjust INCREMENTAL tuning for maximum meter reading.

(g) Adjust attenuator for a meter reading between −10 and +2 dB.

(h) Set SELECTIVITY switch to NARROW and again adjust INCREMENTAL tuning for maximum meter reading.

Step 6
If frequency of signal to be measured is not known, or only approximately known:

(a) Follow procedures a. through d. as given in step 5 above, except that MAIN TUNING mode selector should be set to CONT.

(b) Rotate MAIN TUNING dial until an indication is seen on the meter. If necessary, set attenuator to progressively lower (greater sensitivity) levels and search for signal until a meter indication is obtained. Reduce sensitivity if meter "kick" seems large when passing over signal. A signal 20 dB below the attenuator setting may be readily found with careful tuning.

(c) Set MAIN TUNING mode selector to LOCK and follow procedure e. through h. in step 5 above.

Step 7 Readout

(a) DBM levels. (Assuming INPUT impedance selector set to proper line impedance and line properly terminated.) Signal level is the algebraic sum of the attenuator dB setting and meter reading.

Example: Attenuator −20 dBm, Meter −4 dBm,
(−20) + (−4) = −24 dBm

Example: Attenuator −20 dBm, Meter +1 dBm.
(−20) + (+1) = −19 dBm

Example: Attenuator +20 dBm, Meter −4 dBm.
(+20) + (−4) = +16 dBm

(b) Voltage Levels. (Assuming INPUT impedance selector is set to 600Ω.) The meter has two voltage scales, 0-1 and 0-3. The attenuator range settings 100μ, 1m, .01, .1, 1, 10 volts apply to the 0-1 scale. The range settings 30μ, 300μ, 3m, .03, .3, 3, 30 volt apply to the 0-3 scale. Each attenuator range setting refers to the maximum voltage that can be read on the appropriate meter scale.

Example: Attenuator 1m, Meter .8
Read .8 millivolts, or 800 microvolts.

Example: Attenuator .03, Meter 1.5
Read .015 volts

(c) Frequency. The frequency to which the voltmeter is tuned is the sum of the MAIN TUNING dial indication in megahertz plus the INCREMENTAL tuning dial indication in megahertz (kilohertz reading converted to megahertz).

Example: MAIN TUNING 11.3 MHz from INCREMENTAL tuning 34.5 kHz.
Frequency = 11.3 MHz + .0345 MHz = 11.3345 MHz

Step 8 Recorder Output

If a record of signal level changes on the line or circuit being monitored is desired, a recording device may be driven from the rear chassis jack marked RECORDER. The recording device will then be in series with the meter, but will not affect the meter reading as long as the recorder input resistance is 1200 ohms or less. Since the meter has a 200 microampere movement, approximately 200 microamperes through the recorder input will correspond to +2 dBm. The RECORDER jack is designed for a conventional two conductor phone plug.

5.05 The Sierra 128-PA Balanced Probe is available as an accessory. It adapts the unbalanced input of the 128A to measurement of signals on balanced lines. Either bridging or terminated operation is switch-selected for 135 ohm or 600 ohm lines, with 150 ohms optional. The bridging input has a high impedance for low loss. A chart, attached to the probe body for convenient reference, lists the probe switch settings along with the corresponding voltmeter input settings. The probe also may be used on unbalanced circuits by grounding either probe tip.

5.06 The probe circuitry is enclosed in a metal and plastic case and is fitted with a 5 foot coaxial cable terminated with a BNC connector for attachment to the 128A Voltmeter. Probe tips are spaced 1/2 inch apart to fit the standard spacing on carrier bays. They are 1-1/2 inches long for convenient manipulation on high density equipment. Two sets of flexible extension test leads are furnished to provide maximum auxiliary use of the probe. The test leads attach to the probe tips and provide either pin plug or miniature alligator clip terminals.

SECTION 6
CIRCUIT DESCRIPTION

6.01 This section expands on the general functional descriptions in Section 3. Complete schematic diagrams are included at the end of this section. Refer also to the Functional Block Diagram, Figure 3-1. The circuit descriptions, like the Functional Block Diagram, are divided into four general classifications: Signal Channel, Main Tuning and Frequency Lock Circuits, Incremental Tuning and Frequency Lock Circuits, and Power Supply Circuits.

SIGNAL CHANNEL

6.02 This division of the circuit description includes the circuits in the main signal path through the instrument from input to outputs. In addition, the carrier reinsertion oscillators and the gain reference oscillator are described. Refer to Schematic Diagram Figure 6-2 and to Block Diagram Figure 3-1.

Input Matching and Attenuator Circuit

6.03 **Impedance and Level Adjustment.** The proper load termination impedance to match 75Ω, 135Ω, and 600Ω lines may be selected when INPUT mode selector switch S3 is in the TERM position. The correct line impedance is selected by INPUT impedance selector switch S4A. S4B-S4C sections of this switch function in either TERM or BRG input mode to select the proper level-adjusting network. Level to the preamplifier must be set to compensate for the different voltage levels corresponding to zero dBm across the various line impedances.

6.04 **Attenuator.** The input attenuator is a capacitive divider network which functions to keep the input signal level to the preamplifier within the limits required for the full scale range of the output meter. Thirteen attenuator positions in 10 dB steps, selected by switch S2A-S2B, cover the range from −90 to +30 dBm. Attenuation is reduced to increase sensitivity for every step except for the −90 dBm position. In this position switch S2C operates a relay in the output amplifier circuit which increases the amplifier gain by 10 dB to provide −90 dBm full scale sensitivity.

Preamplifier

6.05 A wide-band well stabilized preamplifier provides an impedance match between the high impedance of the input attenuator and the low impedance of the input filter without sacrificing gain. Q1 is collector bootstrapped with feedback from Q2 to provide a high input impedance and a suitable frequency response characteristic. Q3 includes a frequency response adjustment network in the emitter circuit for flattening the response out to 15 MHz.

Input Lowpass Filter

6.06 Attenuation of all frequencies above the range of the instrument is accomplished by a four section lowpass filter. It is essentially flat over the passband range and cuts off at about 16 MHz. The filter is made adjustable to provide for more precise overall alignment.

First Mixer, First Modulator and First IF

6.07 Frequency conversion from the signal frequency at the instrument input to the first intermediate frequency of 21.05 MHz is carried out in the first mixer. The signal at the input frequency is applied to the base of the mixer transistor Q1. The output of the main tuning oscillator is applied to the first modulator. The output of this balanced modulator is connected across the emitter resistor of mixer transistor Q1. Since the modulator output is balanced to ground, the main tuning oscillator frequency does not appear in the output, but the RF impedance of the modulator output varies at the main tuning oscillator frequency rate. This varying impedance, connected across the emitter resistance of the mixer transistor, causes the gain of Q1 to vary at this rate. The effect is to generate the sum and difference frequencies of the signal and main tuning oscillator frequencies, but to practically eliminate the MAIN TUNING oscillator frequency. The first IF circuit, which provides the load for the collector of the mixer amplifier, is tuned to the difference frequency of 21.05 MHz and thus only this frequency is amplified. The first IF circuit is a steep skirted bandpass filter with a very flat response over a bandwidth of about 150 kHz, centered on 21.05 MHz. This bandwidth is necessary in order to accommodate signals 50 Hz above and below the center frequency of the first IF stage, as the voltmeter is tuned between the 100 kHz lock points with the incremental tuning oscillator. Extreme flatness prevents change in gain over this bandwidth.

Second Mixer and Second Modulator

6.08 The second mixer and modulator circuits operate in a manner similar to the first mixer and modulator. Input to the second modulator is from the second oscillator. First IF signal and second modulator output into the second mixer produce the second intermediate frequency of 2.215 MHz. The second mixer has a single tuned circuit in the collector, tuned to the second intermediate frequency, as does the first stage of the second IF amplifier to which the output of the second mixer is fed.

Second IF Amplifier

6.09 **IF Buffer Amplifiers.** After passing through the initial stage of the second IF amplifier, the signal is applied to the two IF buffer amplifiers. These common-emitter stages not only separate the signal into two parallel channels, but also make it possible to provide the correct source impedance for the two crystal filters connected to their outputs.

6.10 **Crystal Filters.** The crystal filters, FL1 and FL2, determine the overall selectivity of the 128A. Both filters are centered on 2.215 MHz. The NARROW band filter, FL2, has a bandwidth of 250 Hertz, while the WIDE band filter, FL1, has a bandwidth of 3100 Hertz, unless otherwise specified.

6.11 **Narrow and Wide Band Followers.** Each crystal filter is followed by an emitter-follower stage. The amplifiers supply the narrow band or wide band signal to the output amplifier as either channel is selected by SELECTIVITY switch, S1B, S1C, S1D. A second emitter-follower, Q2, on the wide band module takes off the signal ahead of the switch and feeds it to the audio amplifier. Thus the signal is always connected through the wide band follower to the audio output circuits for audio monitoring purposes.

Meter Output Amplifiers and Rectifier

6.12 From either the narrow or wide band followers the signal goes to the output amplifier module. The stages in this amplifier operate at the second intermediate frequency. The first two, selective tuned, stages are separated from the others by a shield placed across the module circuit board.

6.13 Gain in the first stage is increased 10 dB when relay, K1, is closed, actuated by attenuator switch, S2, when it is placed in the –90 dBm position, as noted in Paragraph A.1.b. R2 and part of R4 are shunted out by the relay, increasing the voltage and changing the dc operating point to obtain the additional gain. To ensure maximum gain stability, this stage is temperature stabilized by shunting part of the emitter resistor with a thermistor, RT1.

6.14 The gain of the second stage, Q2, is adjusted by the front panel CAL control, R34, for operational calibration level adjustment. To provide for initial and maintenance calibration the gain of Q3 is varied by adjusting degeneration with the internally mounted control R19. This stage is broadly tuned to the second intermediate frequency.

6.15 The meter rectifier circuit is driven by the two stage, R-C coupled, feedback amplifier Q4-Q5. A large amount of negative feedback is used for stability and output linearity. The rectifier circuit is a modified bridge composed of CR1, CR2, C22, C23. Residual IF is filtered out of the meter circuit with L7-C24, L8-C25.

6.16 A closed circuit jack in series with the meter circuit is included to provide a recorder output. As long as the resistance introduced into the circuit by the recorder input is not more than 1200 ohms the meter reading will not be affected. This is possible since the feedback amplifier is in effect a constant current source.

Audio Amplifier and Detector

6.17 From the second wide band emitter-follower, Q2, the signal is fed to the audio module where it is amplified at the second intermediate frequency in a selective tuned amplifier Q1. The output of Q1 is connected to Q2 which functions as either an AM or single sideband detector. An audio amplifier, Q3-Q4, raises the output of the detector to a level suitable for headphone operation. The signal is brought out to the PHONES jack through an emitter-follower, Q5, which makes possible the use of either high or low impedance phones. Audio level is adjusted by front panel AUDIO GAIN control, R39.

Carrier Reinsertion Oscillators (On Audio Circuit Board)

6.18 When the output of either of the carrier reinsertion oscillators is applied to the input of the detector, Q2, sideband modulation may be recovered. The oscillators are crystal controlled and each is followed by an emitter-follower to prevent excessive loading of the oscillator circuit. The oscillator frequencies are: one 1500 Hertz above and one 1500 Hertz below the second intermediate frequency. Either oscillator, or neither for AM, is selected by front panel switch S6 which controls the collector current supply to the oscillators.

Gain Reference Oscillator

6.19 The 1 MHz crystal controlled oscillator, Q3, with the compound connected squaring amplifier, Q1, Q2, produces a rectangular signal suitable for the routine calibration of the instrument. Output level is highly stable, variation being less than 0.1 dB at normal ambient temperatures. Harmonics of the 1 MHz frequency are accentuated in the network composed of L1-C1-R1 so that frequency check points are available over the full frequency range of the instrument. Placing the INPUT attenuator switch in the CAL position applies B- power to energize the oscillator.

NOTE: Level calibration must be carried out at the 1 MHz frequency only.

MAIN TUNING AND FREQUENCY LOCK CIRCUITS

6.20 Nine circuit board modules mounted in compartments of the MAIN TUNING casting hold the components making up these circuits. See Schematic Diagram Figure 6-2.

Main Tuning Oscillator

6.21 The main tuning oscillator uses a highly stabilized Colpitts circuit and is tuned by MAIN TUNING capacitor C1 over the range 21.1 MHz to 36.1 MHz.

6.22 **Locked Mode.** In this mode, MAIN TUNING mode selector switch S5 is in the LOCK position, the oscillator is locked on frequency every 100 kHz over its full range by means of an error voltage applied to the varactor diode, CR1. The varactor diode is shunted across the oscillator tuning capacitor C1. The error voltage applied to the diode causes its effective capacity to vary in such a direction that the oscillator is maintained in a harmonic relationship with the 100 kHz oscillator over a narrow tuning range around each 100 kHz harmonic point. Generation of the error voltage is accomplished in the frequency lock circuit to be described in Paragraphs 6.26 through 6.36.

6.23 The main tuning oscillator output passes to the input of two amplifiers, one located on the same circuit board and another separately mounted and designated as the main tuning follower. Oscillator output is fed to this module through a relay, K1, which may be used to introduce an external signal into the main tuning follower for synchronous tuning operation. See Paragraph 6.25. The main tuning follower output goes through J8 to the input of the first modulator for frequency conversion of the main signal to the first intermediate frequency. (Parallel connected jack, J9, is used in alignment procedures only.) The other output of the main tuning oscillator passes through an amplifier, Q2, mounted on the main tuning oscillator circuit board, to the main tuning mixer.

6.24 **Continuous Mode.** When the MAIN TUNING mode selector switch, S5, is placed in the CONT position, collector B- supply is disconnected from the 100 kHz oscillator and the main lock indicator modules. At the same time a fixed bias is applied to the varactor diode, CR1, in the main tuning oscillator circuit. Under these conditions the 128A frequency can be tuned continuously over the full range with the MAIN TUNING oscillator control, C1, and the frequency to which it is tuned will be indicated by the reading of the MAIN TUNING dial.

6.25 **Tracking Signal Input.** For synchronous tuning of the instrument a signal from an external tracking signal generator is brought in through front panel connector, J2, marked TRACKING SIGNAL MHZ INPUT. This signal takes the place of the main tuning oscillator output. Control dc voltage to automatically operate relay K1, as well as the external signal, is carried by the center conductor of the connecting cable from the tracking signal generator. When K1 is actuated the B- supply is disconnected from: the main tuning oscillator, main tuning mixer, 100 kHz oscillator and the main lock indicator. At the same time the external signal is connected to the input of the main tuning follower amplifier and fed to the first modulator. (Refer also to Paragraph 6.40.) When these two tracking signal connections are made, tuning of the 128A is completely controlled by, and is synchronous with, the external tracking signal generator.

100 kHz Oscillator and Harmonic Generator

6.26 The crystal controlled 100 kHz oscillator provides the highly accurate frequency which determines the 100 kHz lock points for the main tuning oscillator frequency dial settings. The oscillator, Q1, is connected in a Colpitts circuit. Output is a sine wave which is applied to the input of a Schmitt trigger, Q2-Q3. Since there is an inductance, L2, in the collector circuit of Q3, the Schmitt trigger output has a peaked waveform rich in high order harmonics, which is the desired condition. The oscillator output is isolated from the low impedance input of the main tuning mixer by emitter-follower stage Q4.

Main Tuning Mixer

6.27 The peaked waveform output of the 100 kHz oscillator and harmonic generator is applied to the primary of the main tuning mixer transformer T1 where, due to the resonant rise across the transformer inductance,

it becomes still more sharply peaked. The negative swing is cut off by diode CR1, leaving a narrow positive going pulse as the waveform in the transformer primary.

6.28 The output of the main tuning oscillator is applied to the center tap of the secondary of T1. The combined inputs to T1 are applied to diodes CR2-CR3 which, since they conduct in only one direction, allow an output only for the duration of each 100 kHz pulse.

6.29 The output to the amplifier detector is therefore a wave containing components of both the main tuning oscillator frequency and the fundamental and harmonics of the 100 kHz frequency. When the main tuning oscillator frequency is exactly a harmonic of the 100 kHz oscillator frequency, the output appears as a 100 kHz pulse. See Figure 6-1a, which shows the pulse after being rectified in the detector.

6.30 The 100 kHz pulses are of constant amplitude provided the main tuning oscillator frequency does not attempt to drift, or the main tuning capacitor is not changed slightly. If either of these situations occur the pulses increase or decrease in amplitude, depending on the direction of attempted frequency change. This change in amplitude is due to change in phase relationships between the 100 kHz pulse and the main tuning oscillator signal, and is detected by the following circuits. Such a change generates an error voltage which is immediately applied to the varactor diode and changes its effective capacity slightly. The capacitance change is in the proper direction to maintain the main tuning oscillator frequency in harmonic relation to the 100 kHz signal. Thus in the locked condition the frequency of the main tuning oscillator does not vary. Error voltage is developed by change in phase relationships only.

6.31 When the main tuning oscillator is not in the locked condition the amplitude of the 100 kHz pulses continuously vary. See figure 6-1b. The frequency of the envelope of these variations is the difference between the main tuning oscillator frequency and the frequency of the nearest 100 kHz harmonic, and thus will never be greater than 50 kHz. In this condition the main lock indicator light goes out.

Amplifier Detector, Lowpass Filter and Main Lock Indicator

6.32 Output from the main tuning mixer is passed through an emitter-follower, Q1, and a common-emitter amplifier, Q2, in the amplifier detector module and applied to the base of the detector stage, Q3. The detector output is connected to the lowpass filter, a two stage unit with a cutoff frequency of 50 kHz.

6.33 When the 100 kHz pulses out of the mixer are of constant amplitude, the 100 kHz modulation recovered by the detector is removed by the lowpass filter, and the filter output is a dc voltage which is proportional to average pulse amplitude. A change in average pulse amplitude will therefore cause a change in dc voltage. This is the error voltage that is applied to the varactor diode to maintain the main tuning oscillator on frequency, in the locked condition. See Figure 6-1c.

6.34 When the pulses are continuously varying in amplitude, the unlocked condition, the modulation envelope is detected. Since the envelope frequency is always less than 50 kHz, as noted above, this alternating signal passes through the lowpass filter. See Figure 6-1d.

6.35 The alternating signal out of the lowpass filter is amplified by Q1 in the main lock indicator module and applied to the input of the Schmitt trigger Q2-Q3. This circuit is adjusted to trigger on at a very low ac voltage so that Schmitt-trigger output occurs as soon as the main tuning oscillator lock control is lost. The trigger output flows through relay K1, causing it to open and the LOCKED indicator light to go out.

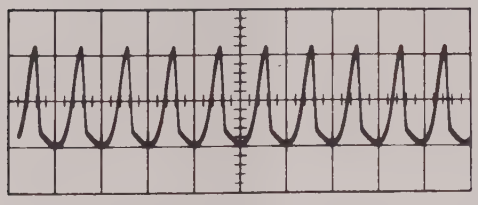
6.36 The same alternating voltage is applied to the varactor diode, but because it fluctuates rapidly it will not cause the oscillator to lock in. When the main tuning oscillator is adjusted so that it is close to a 100 kHz harmonic frequency and the alternating voltage frequency is reduced sufficiently, a point is reached at which the lock circuits take control; the lowpass filter output becomes dc, the Schmitt trigger in the main lock indicator module is cut off and the LOCKED indicator light comes on.

INCREMENTAL TUNING AND FREQUENCY LOCK CIRCUITS

6.37 Eight circuit board assemblies make up the incremental tuning and frequency lock circuits. Each board is mounted in a separate compartment of the INCREMENTAL tuning casting which is located on the right side of the instrument. See Schematic Diagram Figure 6-2.

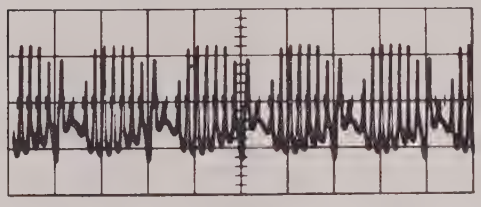
Incremental Tuning Oscillator and First LF Amplifier

6.38 Adjustment of the 128A to frequencies between the 100 kHz harmonic points selected by the main tuning oscillator control is accomplished with the incremental tuning oscillator. This is a very stable Clapp oscillator covering the frequency range of 200 kHz to 310



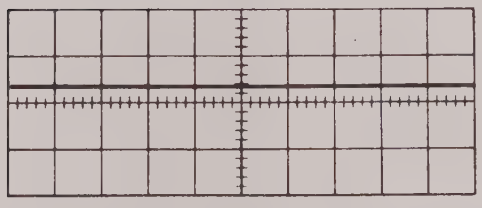
Hor: 10μs/cm

a. 100 kHz Pulses,Locked Waveform,Amplifier Detector Output



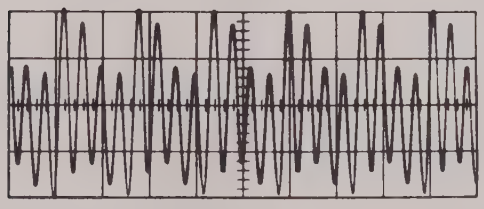
Hor: 50μs/cm

b. 100 kHz Pulses,Unlocked Waveform,Amplifier Detector Output



Hor: 50μs/cm

c. Locked Waveform,Main Tuning Low Pass Filter Output



Hor: 50μs/cm

d. Unlocked Waveform,Main Tuning Low Pass Filter Output

Figure 6-1 Waveforms, Main Timing Oscillator

kHz, tuned with front panel mounted capacitor C1. Tuning dial calibration is from –10 to 0 to 100 kHz, providing a range that overlaps the 100 kHz lock points of the main tuning oscillator.

6.39 Oscillator output is amplified in the common-emitter stage Q1, of the first LF amplifier module. Output then passes through the contacts of relay K1, through two emitter-follower stages, Q2-Q3, to the primary of T1 in the phase discriminator module. The power gain of the emitter-follower stages furnishes the signal level required in the primary of T1.

6.40 Tracking signal generator control for synchronous tuning is fed in through J3 and relay K1. When the connection is made from the external tracking signal generator, dc control voltage carried by the interconnecting cable actuates K1. At this time the incremental tuning oscillator output is disconnected from the circuit, and the tracking signal generator signal is connected to emitter-follower Q2 in its place. See also Paragraph 6.25 above.

Second Oscillator

6.41 To make the frequency conversion from the first IF band of 21.000-21.110 MHz to the second IF of 2.215 MHz the second oscillator tunes over the range of 18.785 MHz 18.895 MHz. Tuning is accomplished solely by means of varactor diode CR1. This is a voltage variable capacitor connected in the tuned circuit of the second oscillator. It functions in a similar manner to the varactor diode in the main tuning oscillator. Adjusting the incremental tuning oscillator causes the voltage across CR1 to be changed by means of the circuits to be described shortly, providing exact control of the second oscillator frequency.

6.42 Output of second oscillator, Q1, is applied to the base of each of two emitter-follower amplifiers, Q2-Q3, both mounted on the second oscillator module circuit board. The output of Q2 is fed through J20 to the input of the second modulator. (Parallel jack, J19, is provided for use in alignment procedures.) From the output of Q3 the signal is applied to the center tap of the mixer transformer in the incremental reference oscillator and mixer module through common-emitter isolation amplifier, Q2.

Incremental Reference Oscillator and Mixer, and Second LF Amplifier

6.43 Control of the second oscillator by the incremental tuning oscillator requires the intermediate step in frequency generation provided by the incremental reference oscillator. This is a crystal controlled Colpitts oscillator operating on a frequency of 18.585 MHz. The oscillator output is fed into the primary of mixer transformer T1. A signal from the second oscillator is fed into the center tap of the secondary of this same transformer through isolation amplifier Q2. These signals are mixed in the output circuit to form a difference frequency which is taken out at the arm of potentiometer, R7. The difference frequency, determined by the tuning of the second oscillator, covers the range of 200 to 310 kHz.

6.44 Mixer output goes to the second LF amplifier, made up of a common-emitter and an emitter-follower stage, where the signal is raised to a suitable level for application to the phase discriminator.

Phase Discriminator and Lowpass Filter

6.45 In this circuit the 200-310 kHz frequency of the incremental tuning oscillator is fed into the primary of T1. The 200-300 kHz output of the incremental reference oscillator mixer is fed into the primary of T2. The output connections of the secondaries of these transformers, the diodes CR1-CR2 and associated components form the phase discriminator circuit. When the two input signals are the same frequency, the output appears as a half-wave rectified signal. This signal passes to the lowpass filter. Since the cutoff frequency of this filter is 125 kHz, the signal frequency components are filtered out and the output is a dc voltage proportional to the average amplitude of the rectified signal components. As long as the two signals are of the same frequency, the average level of the signal components will change as phase relationships between the two input signals change.

6.46 The dc voltage output of the lowpass filter is connected to the varactor diode in the second oscillator and controls the frequency of this oscillator. Control is sufficient to keep the second oscillator continuously locked to the incremental tuning oscillator over its full range of tuning. Since the second oscillator output frequency when mixed with the output of the incremental reference oscillator must generate an output that is the same frequency as that of the incremental tuning oscillator for locking to take place and continue, the control of the incremental tuning oscillator over the second oscillator is exact. Therefore, the oscillators are in the phase locked condition for every setting of the incremental tuning oscillator dial.

Incremental Lock Indicator

6.47 When the input signals to the phase discriminator are not exactly the same frequency, a beat frequency output is produced. This beat will be low in frequency and cannot be greater than 110 kHz in the extreme case (the difference between 200 and 310 kHz), so

it readily passes through the lowpass filter to actuate the incremental lock indicator. As in the main lock indicator, any alternating signal at the input is amplified and actuates the Schmitt trigger, causing the contacts of relay K1 to open and the LOCKED indicator light to go out.

6.48 The unlocked condition normally will only occur for a short period after the instrument is turned on, or if the incremental tuning oscillator dial is rotated very rapidly. This unlocked condition will be only momentary since the lock circuit is very rapid in its action. Diodes CR3-CR4 and associated circuitry on the phase discriminator module aid in the rapid take-over of control for the locked condition.

POWER SUPPLY CIRCUITS

6.49 A 16 volt regulated supply provides power for the voltmeter circuits. Input to the supply may be either 230 volts ac, 115 volts ac or 28 volts dc. The supply is mounted on one circuit board and consists of a solid state rectifier, filter and a series regulator circuit. Diode CR6 prevents the inadvertent application of battery voltage of the wrong polarity. When using a battery power supply, negative polarity must always be connected to J7.

6.50 For 115 volt ac operation, jumper from pin 1 to pin 3 and from pin 2 to pin 4 on the transformer. For 230 volt ac operation, disconnect previous jumpers, and jumper pin 2 to pin 3. The transformer is located on board B02051200.

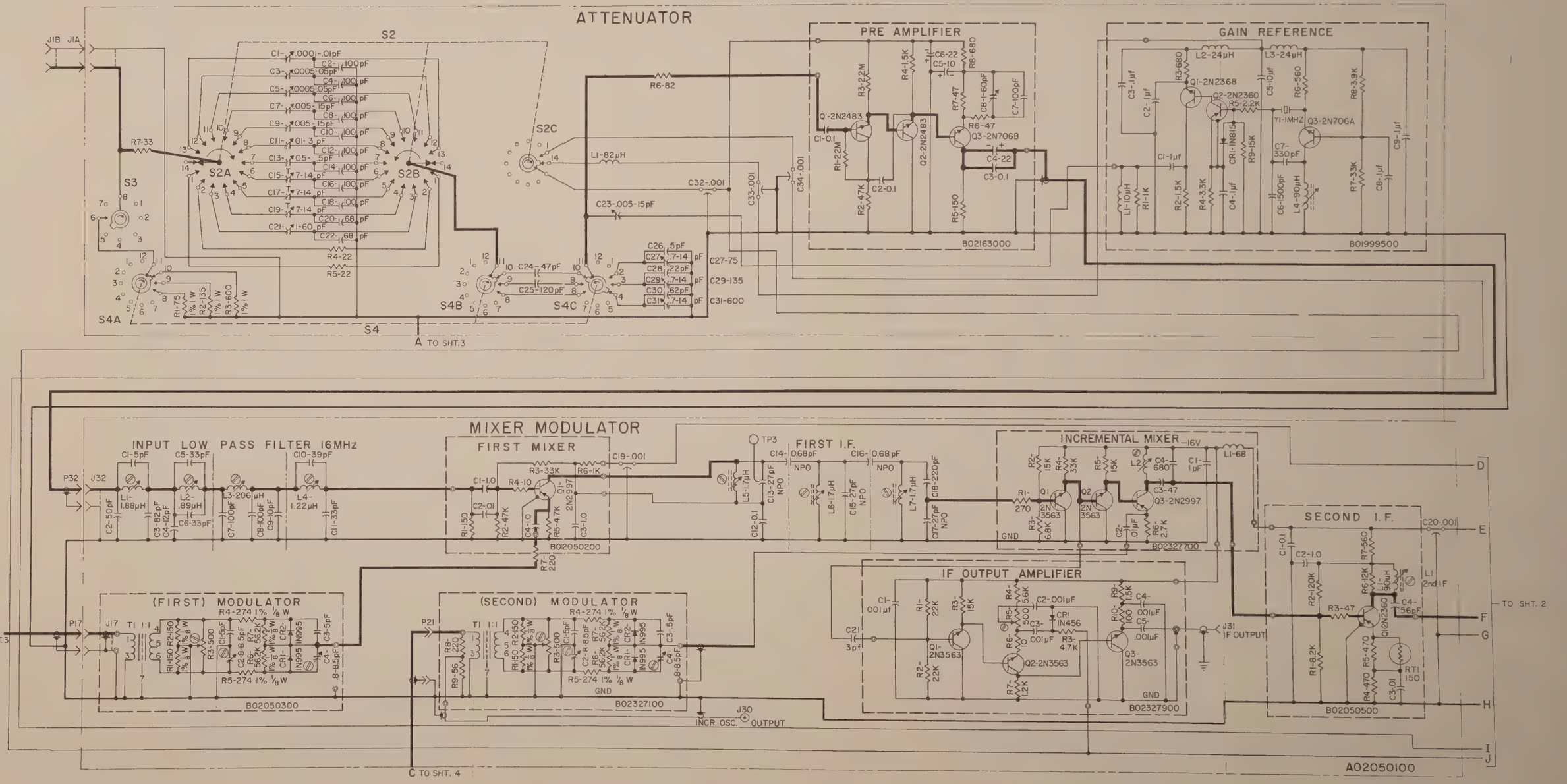


Figure 6-2. Sierra 128A, Schematic Diagram (Sheet 1 of 4)

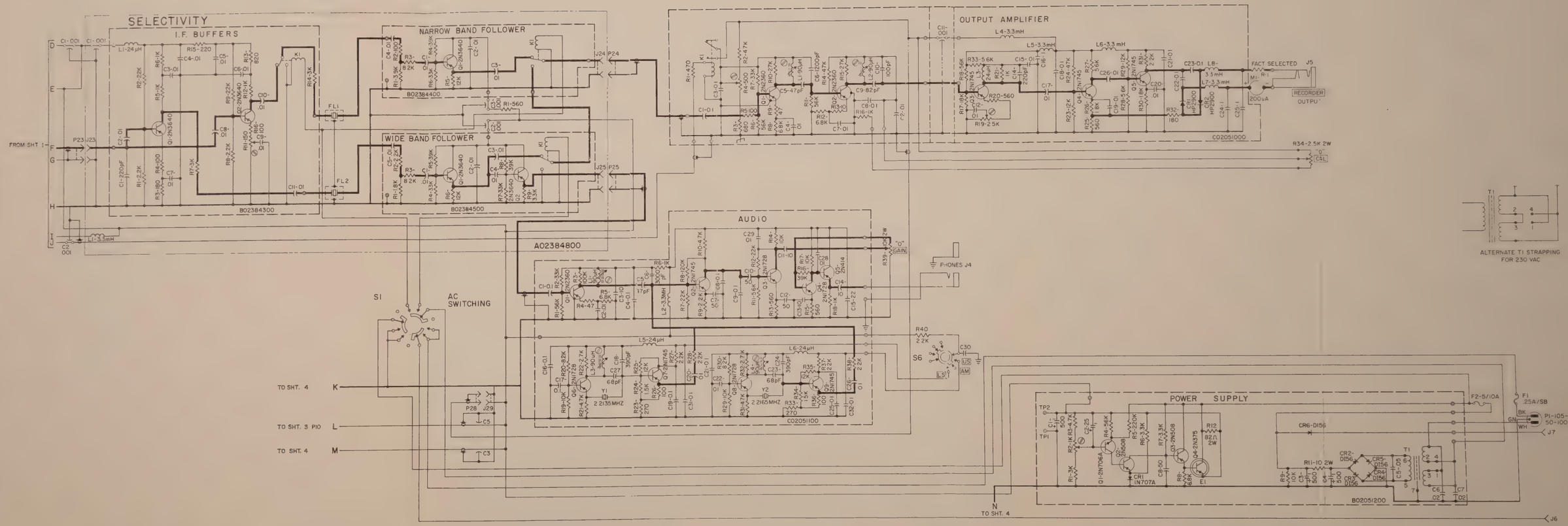


Figure 6-2. Sierra 128A, Schematic Diagram (Sheet 2 of 4)

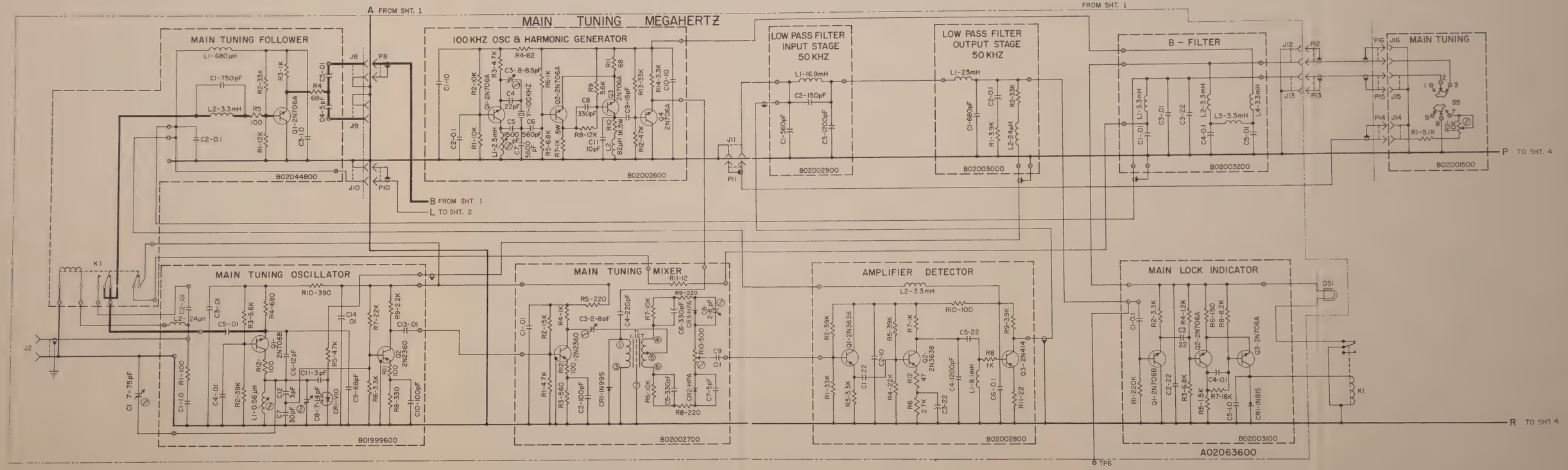


Figure 6-2. Sierra 128A, Schematic Diagram (Sheet 3 of 4)

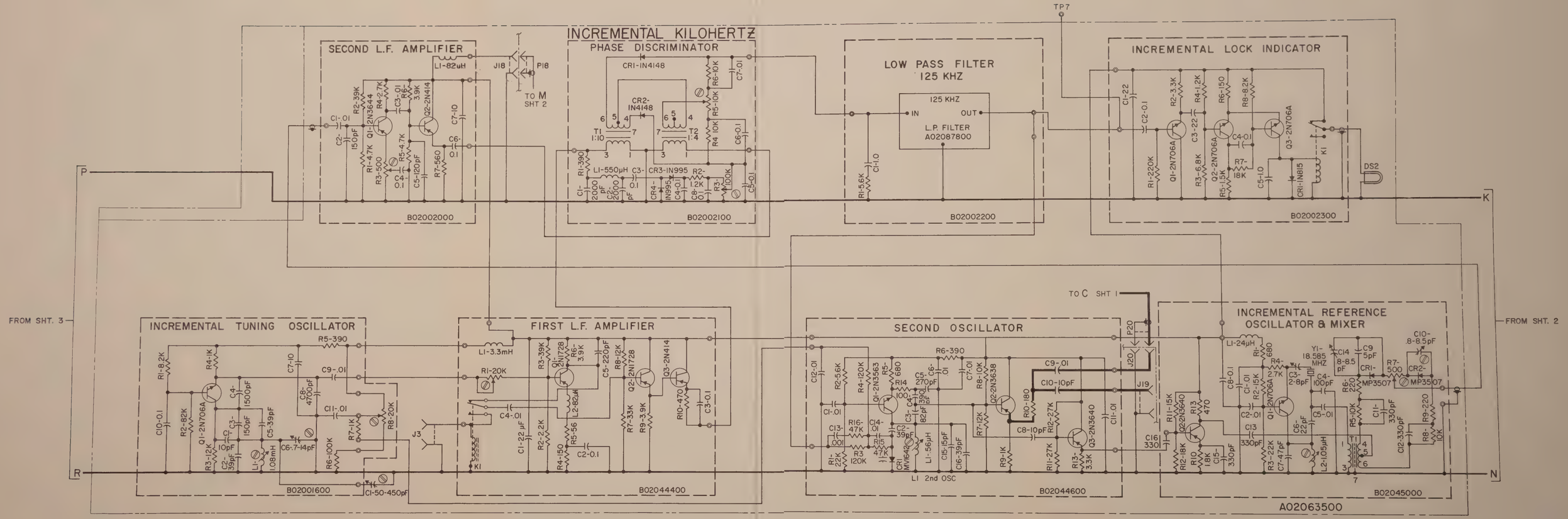


Figure 6-2. Sierra 128A, Schematic Diagram (Sheet 4 of 4)

SECTION 7
MAINTENANCE

7.01 This section contains information useful in maintaining the Sierra 128A Frequency Selective Voltmeter. Maintenance procedures are divided into two general categories: operator maintenance and corrective maintenance. The operator maintenance consists of an operational calibration and replacement of fuses. The corrective maintenance is more comprehensive in scope and is directed toward repair and calibration activities. It consists of a General Specifications Check and a detailed Alignment and Calibration Procedure. Additionally Section 6 provides schematic diagrams as an aid in servicing the instrument. If further information covering service or maintenance of the test set is needed contact your nearest Sierra regional manager or the Customer Service Department.

ADDRESS; Customer Service Department
Sierra Electronic Operation
Philco-Ford Corporation
3885 Bohannon Drive
Menlo Park, California 94025
Telephone (415) 322-7222
TWX: 910-373-1282

NOTE: If defective equipment is to be returned to the factory under the terms of the Warranty, be sure to contact the Customer Service Department of Sierra Electronic Operation for specific instructions prior to packing and shipping the test set.

OPERATOR MAINTENANCE

Operational Calibration

7.02 The operational calibration sets the overall sensitivity of the 128A for all its ranges. No external test equipment is required to perform the calibration. Refer to Paragraph 5.04 for the procedure.

Fuse Replacement

7.03 The instrument has two fuses which are located on the rear panel in standard fuse holders. Fuse F1 is a 0.25 ampere slow-blow fuse in one side of the 115 Vac line. For 230 volt operation it should be replaced with a 0.125 ampere slow-blow fuse as stated in Paragraph 5.02. The other fuse F2 is in the dc output side of the power supply, and it is a 0.5 ampere fast-blow fuse. The fuses and their part numbers are shown in Table 7-1.

7.04 The Sierra 128-PA Balanced Probe schematic diagram is shown in Figure 7-1 and the Replaceable Parts List in Table 7-2.

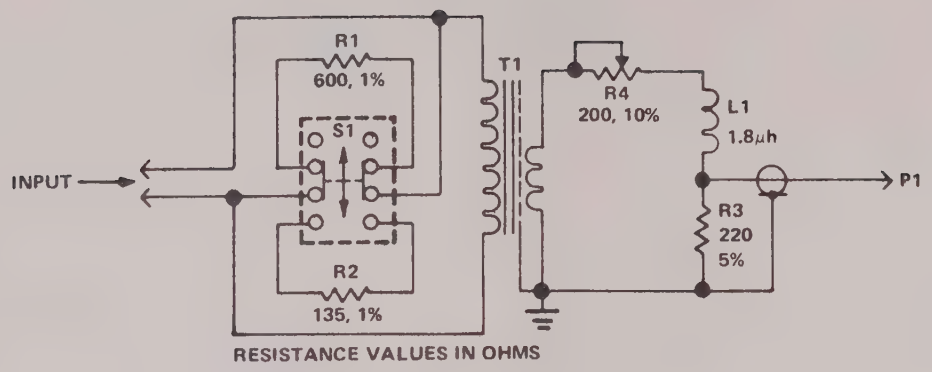
CORRECTIVE MAINTENANCE

7.05 To determine the operating condition of the instrument a General Specification Check is included beginning in Paragraph 7.12. The Alignment and Calibration Procedure beginning in Paragraph 7.19 should be used only after a major repair affecting alignment, and then only when all the required test equipment is available so that the complete procedure can be accomplished.

NOTE: Since the sequence of the procedure is important in many places, a single section of the alignment must be carried out with due regard for the relationship of the preceding and following sections.

Table 7-1. Field Replaceable Parts

DESCRIPTION	SIERRA STOCK NO.	MFR.	MFR. PART NO.
F1, Fuse 0.25A, 125V, Slow-Blow, 3AG for 230 volt operation use:	913200033	Littelfuse	313.250
F1, Fuse 0.125A, 250V, Slow-Blow, MDA	913200050	Bussman	MDA 1/8
F1, Fuse 0.5A, 3AG	913200036	Littelfuse	312.500



NOTE: For 150Ω Impedance Operation, R2 changes to 150Ω 1% *

Figure 7-1. Sierra 128-PA Balanced Probe Schematic Diagram

Table 7-2. Sierra 128-PA Replaceable Parts List

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
L1	INDUCTOR, Micromin., 1.8 h	909000127	Miller	9230-26	1
P1	PLUG AND CABLE ASSEMBLY		Sierra	B02045300	1
R1	RESISTOR, Fixed, Metal film, 600 ohm 1% 1/4W	908300001	Campbell	M-07	1
R2	RESISTOR, Fixed, Metal film, 135 ohm 1% 1/4W	908300002	Campbell	M-07	1
R2*	RESISTOR, Fixed, Metal film, 150 ohm 1%, 1/4W	908300130	Campbell	M-07	1
R3	RESISTOR, Fixed, Composition, 200 ohm, 5% 1/4W	906900221	Allen Bradley	CB	1
R4	RESISTOR, Variable, Cermet, 200 ohm, 10% 1/8W	907900190	CTS	385PC 201A	1
S1	SWITCH, Slide, DP 3 position, miniature	911000028	Continental Wirt	G-128L	
T1	TRANSFORMER		Sierra	SS-14782-1	

*Special order instruments only.

7.06 If troubleshooting becomes necessary, a good understanding of circuit operation and signal flow paths as described in Section 6, Circuit Description, and the Schematic Diagram, Figure 6-2, will aid greatly in determining the cause of trouble. Refer also to the Functional Block Diagram, Figure 3-1, and to the Signal Levels Block Diagram, Figure 7-2.

7.07 The Signal Levels Block Diagram shows the signal level voltage at numerous points along the signal flow path. Voltages indicate the rms signal level to be

introduced at that point to obtain a 0 dB reading on the meter of the 128A. The frequency of the signal will be the frequency that normally occurs at that point as indicated on the diagram. Signal levels may be expected to vary somewhat in different instruments.

7.08 Waveforms, frequency and amplitude of the frequency lock circuits are given in Figures 7-5 and 7-8.

7.09 Locations of module and calibration adjustment points are given in Figures 7-3, 7-4, 7-6, 7-7, 7-9, and 7-10.

7.10 The circuit boards have a number screened on the component side. This is the same number as that which appears within the dashed-line box indicating the module on the schematic diagram. The name of the module is etched on the foil side of the circuit boards. This name also is the same as that appearing on the schematic diagram.

7.11 The following general sequence of trouble tracing is suggested:

Step 1
Make sure all cable connectors are properly connected and tightened snugly.

Step 2
Check power supply output voltage. It should be −16 ±0.25V dc.

Step 3
Using a wideband oscilloscope (such as Tektronix 581) check for proper output at J8, main tuning follower, and at J20, second oscillator. This check will localize the trouble to either of the tuning modules or to the signal flow path modules.

Step 4
If the output of either tuning module is improper as to frequency, waveform or amplitude, Figure 7-5a or 7-8a, the various module circuits should be carefully checked using the waveforms of Figures 7-5 and 7-8 as a guide to proper operation.

Step 5
If tuning and module output waveforms appear to be correct, the trouble is probably in the signal flow path modules. Refer to Figure 7-2 and introduce a signal of the proper amplitude and frequency at a point midway along the signal path. For example: a 2.215 MHz, 475 microvolt signal into the input of the second IF amplifier. (tuning modules must be connected and operating for these tests).

Step 6
If the panel meter reads approximately 0 dB, select a point farther back toward the input to introduce the next test signal.

Step 7
If panel meter reading varies widely from 0 dB, or no reading is obtained for the test of Paragraph 5 above, select a point closer to the meter and introduce the proper test signal.

Step 8
Follow the above procedure until faulty module is bracketed between two closely spaced test points.

NOTE: The attenuator must not be placed in the −90 dB position for these tests. In this position an extra 10 dB gain is introduced into the output amplifier.

Step 9
When the faulty module has been located, check the signal flow through that module and check individual components as necessary.

General Specifications Check

7.12 TEST EQUIPMENT REQUIRED. The following test equipment, or equivalent, is required to perform the General Specifications Check.

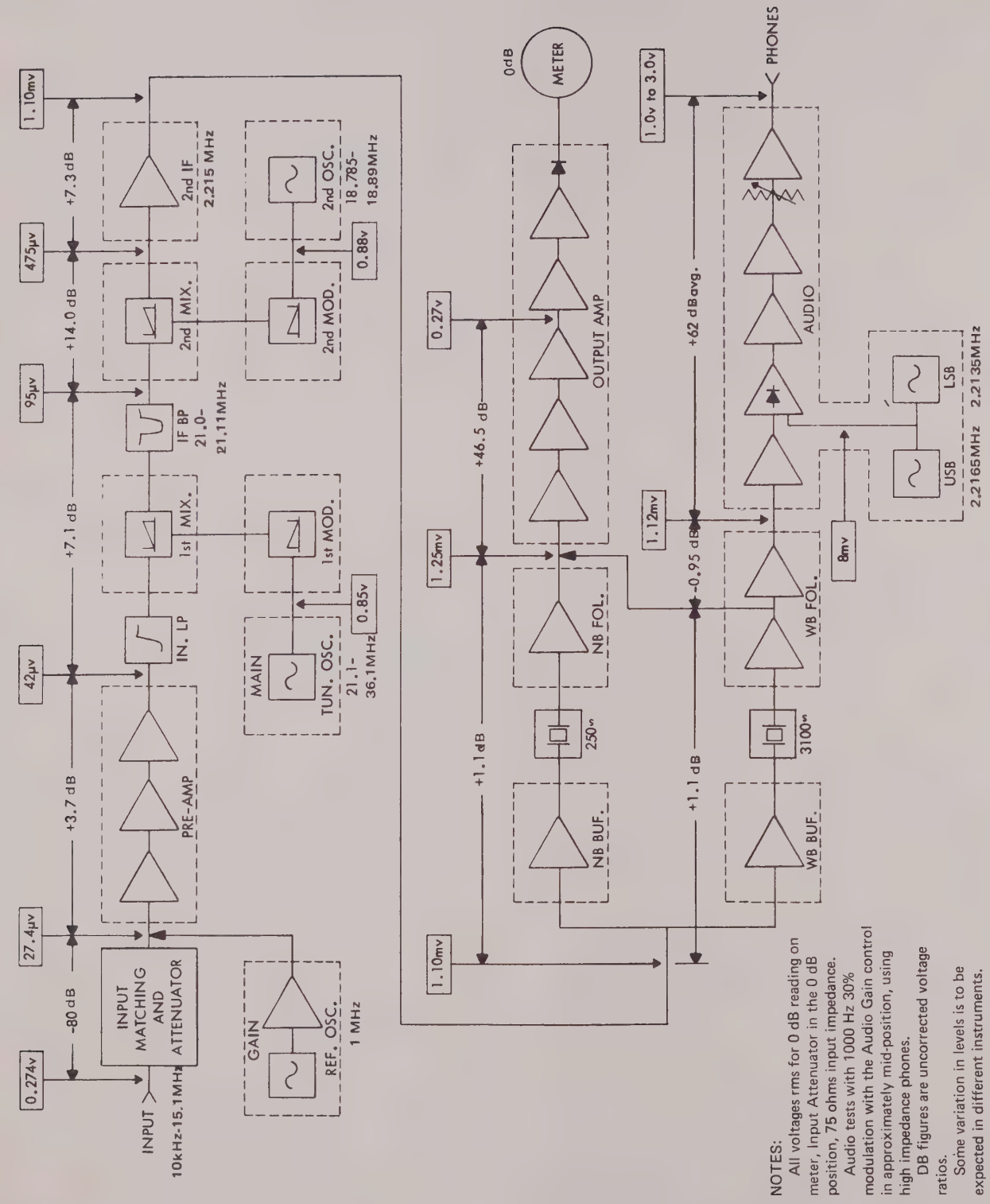
RF Signal Generator	HP606A
Frequency Counter	HP524C
50 ohm Coaxial Termination Load	Sierra 160-1
AC VTVM	HP400L
RF Microvoltmeter with 50 ohm probe	Millivac MV28B
VHF Attenuator	HP355D
Audio Oscillator	HP200CD
100 kHz Lowpass Filter, 600 ohms	–

The Sierra 128A being checked will be referred to as the voltmeter in the following procedure.

7.13 FREQUENCY ACCURACY OF LOCK SYSTEM

Step 1
Connect the output of the RF Signal Generator to the Frequency Counter and connect both to the input of the voltmeter.

Step 2
Set the voltmeter attenuator to CAL, 75 ohm/TERM, SELECTIVITY to NARROW, MAIN TUNING mode to



NOTES:
All voltages rms for 0 dB reading on meter, Input Attenuator in the 0 dB position, 75 ohms input impedance.
Audio tests with 1000 Hz 30% modulation with the Audio Gain control in approximately mid-position, using high impedance phones.
DB figures are uncorrected voltage ratios.
Some variation in levels is to be expected in different instruments.

Figure 7-2. Signal Levels, Block Diagram

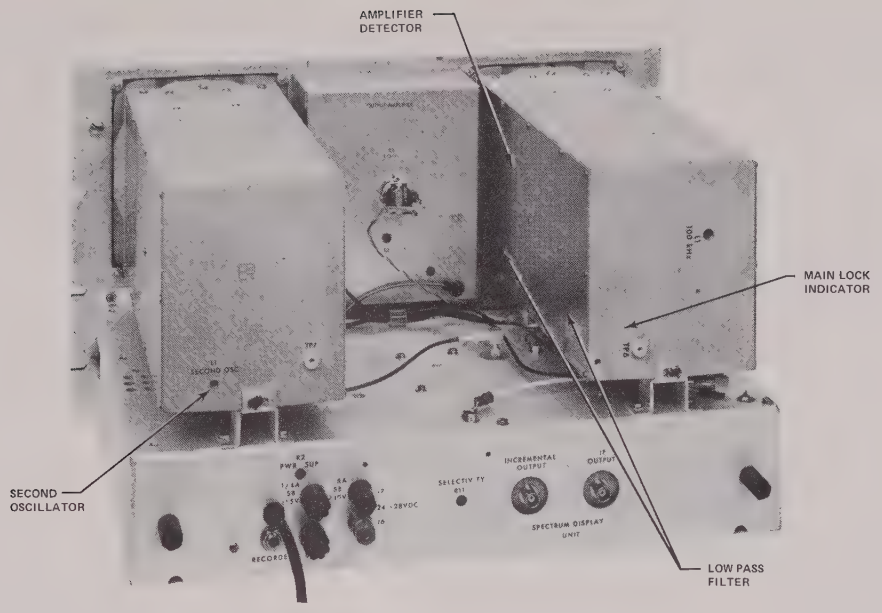


Figure 7-3. Rear View, Module Location

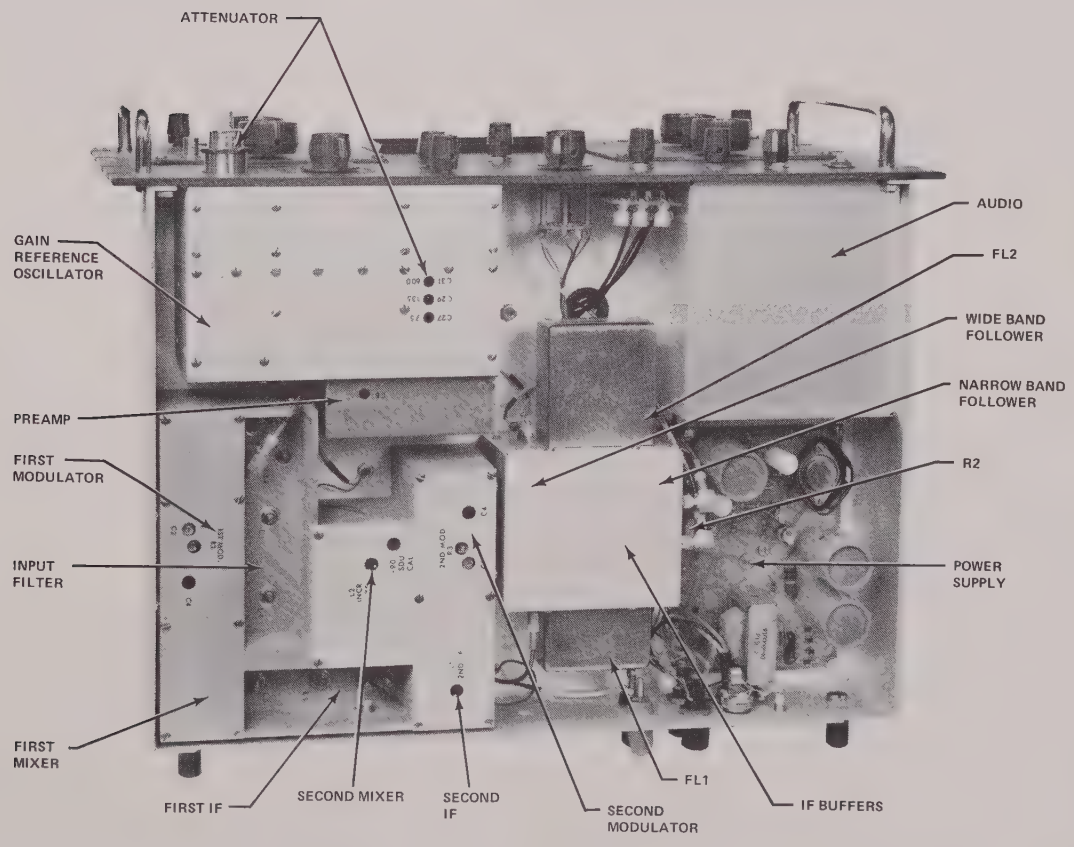


Figure 7-4. Bottom View, Module Location

LOCK, MAIN TUNING dial to 1 MHz, locked, and the INCREMENTAL tuning dial to 0.0 kHz.

Step 3
Carefully tune the INCREMENTAL dial for maximum indication and set the cursor adjustment exactly to the 0.0 kHz point on the INCREMENTAL tuning dial. (This accurately sets the INCREMENTAL dial tuning using the reference oscillator in the voltmeter.)

Step 4
Set the MAIN TUNING to 0.1 MHz locked, and the attenuator to 0 dBm.

Step 5
Adjust the output of the RF Signal Generator to approximately 0 dB. Very carefully tune for maximum indication on the voltmeter. Check very carefully for maximum indication. The Frequency Counter should now read within ±302 Hertz of 100 kHz.

Step 6
Set the MAIN TUNING to 1.0 MHz, locked. Tune the RF Signal Generator very carefully for maximum indication on the voltmeter. The Frequency Counter should read within ±(20+300) = ±320 Hertz of 1.0 MHz.

Step 7
Set the MAIN TUNING dial to 15.0 MHz, locked, and tune RF Signal Generator very carefully for maximum indication on the voltmeter, as above. The Frequency Counter should read within ±600 Hertz of 15.0 MHz.

7.14 MEASUREMENT ACCURACY, 0 dBm CALIBRATION AT REFERENCE FREQUENCY OF 1 MHz.

Step 1
Set the voltmeter attenuator to CAL, 75 ohm/BRG, SELECTIVITY to NARROW, MAIN TUNING mode to LOCK, MAIN TUNING dial to 1.0 MHz, locked, and INCREMENTAL tuning dial to 0.0 kHz.

Step 2
Carefully tune the INCREMENTAL tuning dial for maximum indication on the meter and adjust the CAL control for an exact 0 dBm reading.

Step 3
Set the voltmeter attenuator to 0 dBm.

Step 4
Connect the RF Signal Generator to the voltmeter using RG-58/U cable and BNC Tee connectors. Terminate the cable at the voltmeter end with the termination load and connect the AC VTVM also to the input of the voltmeter.

75 Ohm Input Impedance

Step 5
Set the RF Signal Generator to 1 MHz and the output to 0.274 volts as read on the AC VTVM. (The accuracy of the AC VTVM should be 1% or better.)

Step 6
Carefully tune the Signal Generator for maximum indication on the voltmeter panel meter. Reading should be 0 dBm ±0.2 dB.

135 Ohm Input Impedance

Step 7
Set voltmeter input to 135 ohms/BRG and adjust the RF Signal Generator output to 0.367 volts as read on the AC VTVM.

Step 8
Carefully tune the Signal Generator for maximum indication on the voltmeter panel meter. Reading should be 0 dBm ±0.2 dB.

600 Ohm Input Impedance

Step 9
Set the voltmeter input to 600 ohms/BRG and adjust the RF Signal Generator output to 0.775 volt as read on the AC VTVM.

Step 10
Carefully tune the Signal Generator for maximum indication on the voltmeter panel meter. Reading should be 0 dBm ±0.2 dB.

7.15 FREQUENCY RESPONSE, REFERRED TO 1 MHz

Step 1
Connect the RF Signal Generator to the voltmeter using RG-58A/U cable and a BNC Tee connector at the voltmeter input. Connect the RF microvoltmeter 50 ohm probe to the Tee at the voltmeter input. The 50 ohm probe serves as the termination for the cable.

Step 2
Set the voltmeter input attenuator to 0 dBm, 75 ohms/BRG, SELECTIVITY to NARROW, MAIN TUNING to 1 MHz, locked, INCREMENTAL tuning to 0.0 kHz.

Step 3
Adjust the RF Signal Generator to 1 MHz and tune for maximum output on voltmeter panel meter. Adjust for exact 0 dB reading and note RF microvoltmeter reading. (The RF microvoltmeter must be calibrated for 1% accuracy or better at the frequencies at which readings are taken.)

Step 4
Set RF Signal Generator and voltmeter to 100 kHz and adjust Signal Generator for same output as noted in Step 3 above and note reading of voltmeter panel meter. In the same manner set to 10 MHz and note reading. It should be within ±0.2 dB of 0 dB in each case.

Step 5
Set to 15 MHz and 10 kHz, as above, and note voltmeter readings. They should be within ±0.5 dB of 0 dB. The audio oscillator must be used for the 10 kHz setting.

7.16 ATTENUATOR ACCURACY REFERRED TO 0 dBm

Step 1
Connect the RF Signal Generator to the input of the VHF attenuator. Terminate the output of the VHF attenuator with 50 ohms and connect to the input of the voltmeter. The termination must be at the voltmeter input.

Step 2
Set the voltmeter attenuator to 0 dBm, 75 ohm/BRG, SELECTIVITY to WIDE, MAIN TUNING mode to LOCK, MAIN TUNING to 1 MHz, locked and INCREMENTAL tuning to 0.0 kHz.

Step 3
Set the VHF attenuator for 10 dB attenuation, set the RF Signal Generator to 1 MHz, tune for maximum output on voltmeter panel meter and adjust for exactly 0 dB reading on the voltmeter.

Step 4
Set the VHF attenuator for 20 dB attenuation and set the voltmeter attenuator to −10 dBm. Voltmeter should read 0 dBm ±0.1 dB.

Step 5
Follow the procedure of step 4 above, increasing VHF attenuator attenuation in 10 dB steps and at the same time decreasing the voltmeter attenuation in 10 dB steps until the VHF attenuator reads 100 dB and the voltmeter is set to −90 dBm. Voltmeter should read 0 dB ±0.1 dB at each step.

Step 6
Set the voltmeter to +10 dBm and the VHF attenuator to 0 dB and note reading.

Step 7
Set the voltmeter successively to +20 dBm and +30 dBm and read meter at −10 dB and −20 dB. All readings should be ±0.1 dB taking scale linearity (Paragraph 7.32) into account in the −10 dB and −20 dB readings.

Step 8
Follow the procedure of steps 3 through 7 for 100 kHz, 5 MHz, 10 MHz, and 15 MHz. Reading tolerances are:

100 kHz to 1 MHz, −90 dB to +30 dB, ±0.1 dB
10 kHz to 5 MHz, −90 dB to +30 dB, ±0.2 dB

5 MHz to 10 MHz, −70 dB to +20 dB, ±0.2 dB
5 MHz to 10 MHz, −90 dB to +30 dB, ±0.3 dB

10 MHz to 15 MHz, −70 dB to +20 dB, ±0.3 dB
10 MHz to 15 MHz, −90 dB to +30 dB, ±0.8 dB

7.17 SPURIOUS RESPONSE

Step 1
Set the voltmeter attenuator to CAL, 75 ohm/BRG, SELECTIVITY to NARROW, MAIN TUNING mode to LOCK, MAIN TUNING dial to 1.0 MHz, locked, and INCREMENTAL tuning dial to 0.0 kHz.

Step 2
Carefully tune the INCREMENTAL tuning dial for maximum indication on the meter and adjust the CAL control for an exact 0 dBm reading.

Step 3
Connect the RF Signal Generator to the voltmeter with RG-58A/U cable and BNC Tee connector.

Step 4
Terminate the cable with 50 ohm termination load at the voltmeter input.

Direct First IF Response

Step 5
Tune the RF Signal Generator to 21.0 MHz and adjust for 0.274 volts output.

Step 6
Set voltmeter attenuator to −70 dBm, 75 ohm/BRG, SELECTIVITY to WIDE.

Step 7
Carefully tune the Signal Generator for maximum response on the meter. Fine tune with voltmeter INCREMENTAL tuning control. Meter should read less than 0 dB (below – 70 dBm).

Direct Second IF Response

Step 8
Set the voltmeter attenuator to –80 dBm, 75 ohm/BRG, MAIN TUNING to 1.0 MHz, locked, SELECTIVITY to WIDE.

Step 9
Set the Signal Generator to 2.215 MHz and adjust for 0.274 volts output. Carefully tune the Signal Generator for maximum response. Voltmeter should read less than 0 dB (below –80 dBm).

Residual Distortion Attenuation

Step 10
Connect the 600 ohm, 100 kHz lowpass filter to the output of the audio oscillator. Connect the output of the filter to the input of the voltmeter.

Step 11
Set the voltmeter attenuator to 0 dBm, 600 ohms/TERM, SELECTIVITY to NARROW, MAIN TUNING mode to LOCK, MAIN TUNING dial to 0.1 MHz, locked, and INCREMENTAL tuning to 0.0 kHz.

Step 12
Set the audio oscillator to 100 kHz, tune for maximum indication on the voltmeter and adjust for a 0 dB reading.

Step 13
Set the voltmeter attenuator to –50 dBm and tune the voltmeter for a response at 200 kHz. Response should be less than –15 dB on the meter (below –65 dBm).

Step 14
Tune the voltmeter for a response at 300 kHz. Response should be less than –15 dB on the meter (below –65 dBm).

7.18 AUDIO OUTPUT

Step 1
Set the RF Signal Generator to 1 MHz, modulated 30% with 1 kHz, connect to the INPUT of the voltmeter and adjust for a 0 dB reading on the voltmeter with SELECTIVITY set to WIDE.

AM Check

Step 2
Set the AUDIO MODE switch to AM, the GAIN control fully counterclockwise and plug phones (600 ohms impedance or higher) into the PHONES jack. Use lower jack for single plug.

Step 3
Advance GAIN control until a signal is heard at a comfortable listening level, GAIN control should be in the vicinity of mid-range.

SSB Check

Step 4
Switch off the modulation in the RF Signal Generator.

Step 5
Set the AUDIO MODE switch to LS and then to US. A tone of approximately 1500 Hertz in frequency should be heard in each position. Frequency of tone will depend on voltmeter tuning.

Alignment and Calibration

7.19 No change in adjustments should be made unless the required test equipment is available and complete alignment procedures may be carried out. In this procedure the instrument being aligned will be referred to as "the voltmeter".

7.20 TEST EQUIPMENT REQUIRED. The following listed test equipment or equivalent, is required for the alignment and calibration procedure:

RF Signal Generator	HP606A
Milliammeter	HP428B
DC VTVM	HP412A
AC VTVM	HP400L
VHF Attenuator	HP355D
Frequency Counter and Converter	HP524C and 525A
50 ohm Coaxial Termination Load	Sierra 160-1
RF Microvoltmeter with High Impedance Prde	Millivac MV28B
RF Oscilloscope	Tektronix 581
Attenuator Network	Daven VT795G
Audio Oscillator	HP200CD
Metered Variac	General Radio W5MT3A
DC Digital Voltmeter (DVM)	Dana 3800A

7.21 POWER SUPPLY

Step 1
Measure dc resistance to ground, TP2 to TP1. Should be no less than 60 ohms with MAIN TUNING mode switch to CONT and no less than 40 ohms in LOCK.

Step 2
Connect the voltmeter to a variable 115 volt ac source.

Step 3
Connect the DC VTVM to TP2, (B-) and TP1 (ground) on the power supply circuit board.

Step 4
Adjust the ac source to 115 volts and switch the voltmeter on.

Step 5
DC VTVM should read –16.0 volts. If not, adjust R2 in the power supply until a reading of –16.0 volts is obtained.

Step 6
Remove F2 (0.5 amp fuse) and connect milliammeter across fuse terminals. Full load dc current should be approximately 300 mA.

Step 7
Vary the ac source voltage between 105V and 125V. There should be no change in the DC VTVM reading. A change would indicate voltage regulator trouble.

Step 8
Connect the DC VTVM to the external battery input jacks, J6-J7

Step 9
Short CR6 in the power supply with a clip lead. DC VTVM should read –16.0 to –28 volts.

Step 10
Remove the clip lead from CR6 and observe that voltage is removed from J6-J7. This checks proper operation of CR6 which is to prevent wrong polarity connection of an external battery supply.

7.22 AUDIO CIRCUITS

Step 1
It is necessary to remove the audio cover shield to gain access to all adjustments on the audio module.

Step 2
Disconnect J25 input to the audio circuit.

Step 3
Connect the frequency counter to the vertical amplifier output of the oscilloscope.

Step 4
Connect the vertical input of the oscilloscope to the junction of C20-R28 on the audio module and turn the detector MODE switch to LS.

Step 5
Adjust L3 on the audio module for maximum indication on the oscilloscope (approximately 0.8 volt p-p) and check that the frequency reading on the counter is 2.2135 MHz ±110 Hz.

Step 6
Connect the oscilloscope to the junction of C26-R38 on the audio module and turn the detector MODE switch to US.

Step 7
Adjust L4 for maximum indication on the oscilloscope (approximately 0.8 volt p-p) and check that the frequency reading on the counter is 2.2165 MHz ±100 Hz.

Step 8
Connect the Signal Generator to P25, (input to the audio module) and the oscilloscope to the base of Q2 on the audio module. Tune the Signal Generator to 2.215 MHz and adjust modulation to 30% at 1 kHz. Set RF output to approximately 700μV.

Step 9
Connect the AC VTVM to the PHONES jack J4, turn the AUDIO GAIN control, R39, to approximately mid-position and set AUDIO MODE switch to AM.

Step 10
Adjust L1 for maximum indication on the AC VTVM.

Step 11
Output voltage for each setting of the detector MODE switch should be approximately as follows:

AM – 1.0-3.0 volts modulated
LS – 1.0-3.0 volts unmodulated
US – 1.0-3.0 volts unmodulated

Step 12
Reconnect P25 to J25.

7.23 OUTPUT AMPLIFIER

Step 1
Connect the Signal Generator to P24 (input to the output amplifier module), tune to 2.215 MHz and set the output to approximately 500 μV.

Step 2
Set the voltmeter front panel CAL control and R19 on the output amplifier PCB to approximately center position.

Step 3
Set the voltmeter attenuator switch to –90 dB, 75 ohm/TERM. Check that the relay K1 on the output

amplifier PCB operates as attenuator switch is moved from -80 dB to -90 dB position.

Step 4
Adjust L1 and L2 in the output amplifier for maximum deflection on the voltmeter panel meter, approximately 0 dB.

Step 5
Set the Signal Generator output for an exact 0 dB reading.

Step 6
Switch the voltmeter attenuator to the -80 dB position and raise the Signal Generator output 10 dB.

Step 7
Adjust R4 on the output amplifier PCB for a 0 dB reading.

Step 8
With R19 at approximately 4.5 dBm from high gain end and CAL pot centered and the attenuator positioned to -90 dB, the input level from the Signal Generator should be between 100 μV and 120 μV for a 0 dB reading on the meter.

Step 9
Reduce the Signal Generator output by 10 dB for a -10 ±0.2 dB reading on the meter.

7.24 CRYSTAL FILTER

Step 1
Connect the Signal Generator to J23 (input to the IF buffers), tune to 2.215 MHz and set output to approximately 500 μV.

Step 2
With the voltmeter in narrow band adjust frequency of generator for peak response on the 128A meter.

Step 3
Set the voltmeter front panel SELECTIVITY switch to WIDE and set the CAL control (or Signal Generator output) for an exact 0 dB reading on the voltmeter panel meter.

Step 4
Turn SELECTIVITY switch back to narrow and adjust R11 on the IF buffer PCB for a 0 dB reading. Reconnect cable to P23.

7.25 SECOND IF

Step 1
Remove the T shaped cover from the IF casting.

Step 2
Set the voltmeter attenuator to -90 dBm.

Step 3
Tune the Signal Generator to 2.215 MHz and set the output to approximately 15 μV.

Step 4
Using a 0.1 μF capacitor connect the Signal Generator to the input of the second mixer. Disconnect the orange wire which is fed through a hole in the PCB. Connect the Signal Generator to the pad on the PCB where the orange wire was soldered.

Step 5
Set the voltmeter SELECTIVITY switch to WIDE.

Step 6
Adjust L1 in the second IF and L1 in the second mixer for maximum deflection on the voltmeter panel meter.

Step 7
Reconnect the orange wire to PCB and replace IF cover.

7.26 BASIC ALIGNMENT OF SIGNAL PATH

CAUTION: Before attempting alignment procedure, first determine if the 100 kHz bandpass characteristic is flat by performing the bandpass check. If the bandpass check shows the equipment is out of limits, or if repairs have been made in this section, perform the steps in Paragraph 7.34. Once the bandpass characteristic has been determined to be flat, then proceed with the alignment beginning with step 1.

110 kHz Bandpass Check

Switch the voltmeter to "CONT", "75Ω", TERM", "CAL" and "NARROW", tune for the following peaks:

1. Main at 1.000 MHz:
   Incr. at 0 kHz (Cal Adj. Ref.)
2. Main at 1.010 MHz:
   Incr. at -10 kHz (Limit: ±0.1 dB)
3. Main at 0.960 MHz:
   Incr. at 40 kHz (Limit: ±0.1 dB)
4. Main at 0.930 MHz:
   Incr. at 70 kHz (Limit: ±0.1 dB)
5. Main at 0.900 MHz:
   Incr. at 100 kHz (Limit: ±0.1 dB)

Step 1
Set the INCREMENTAL tuning dial to the 0.0 position. Set the MAIN TUNING dial to 1.0 MHz. Set the voltmeter

input attenuator to –80 dB, 75 ohm/BRG and set the SELECTIVITY switch to NARROW.

Step 2
Tune the Signal Generator to 1 MHz, with 30%, 1 kHz modulation. Set the output to approximately –80 dB and connect to the voltmeter input (terminated with 50 ohms). Tune the incremental oscillator for maximum panel meter deflection.

Step 3
Readjust the following inductances for maximum panel meter deflection: L1 in the second mixer, L1 in the second IF, L1, L2 in the output amplifier.

Step 4
Connect the AC VTVM to the phones jack J4, set detector MODE switch to AM and tune L1 in the audio amplifier to maximum indication on the AC VTVM.

FIRST MODULATOR

7.27 Correct output from and proper frequency locking of the MAIN TUNING and INCREMENTAL tuning modules is required for the following modulator alignment procedures. The appropriate parts of Paragraphs 7.30 and 7.31 should be carried out at this point if necessary.

Step 1
Set the voltmeter attenuator to –20 dB, 75 ohm/TERM and the SELECTIVITY switch to NARROW.

Step 2
Set the MAIN TUNING dial to 0.0 MHz and tune the INCREMENTAL tuning oscillator to 10 kHz. Voltmeter in locked condition.

Step 3
Set C2, C4 in the first modulator to mid range.

Step 4
Disconnect preamplifier cable from J32.

Step 5
Tune the INCREMENTAL oscillator toward 0 kHz and adjust R3, C2, C4 in the first modulator to minimize meter reading while tuning the incremental oscillator further toward 0, until an adjustment minimum is reached. Reconnect the preamplifier cable to J32. A 3 kHz setting on the incremental oscillator should cause a meter reading of less than –20 dB with attenuator in the –90 dB, 75 ohm/TERM position.

SECOND MODULATOR

7.28 The following procedure requires that the voltmeter be adjusted for true gain. To ensure this requirement perform the steps in Paragraph 7.33, steps 1 through 4.

Step 1
Set the voltmeter SELECTIVITY switch to NARROW and the main tuning dial to 0.1 MHz. Set the input attenuator to –90 dB, 75 ohm/TERM.

Step 2
Tune the incremental tuning oscillator slowly from 0 to 100 kHz. Note the residual noise level on the output meter. It should be 1.0 microvolt or less on the 30 microvolt scale.

Step 3
Check for spurious response as the incremental tuning oscillator is tuned to 100 kHz. Advance R3 in the first modulator two complete turns. This should bring the spurious response up to approximately –80 dB.

Step 4
Set C10 and C14 in the incremental reference oscillator and mixer to midrange. Starting with R7, alternately adjust R7, C10 and C14 for the lowest possible level of the spurious response noted in step 3 above.

Step 5
Rebalance the first modulator with R3, Paragraph 7.27 above.

Step 6
Retune as in step 1 above. With incremental tuning oscillator set to 100 kHz the spurious response should be –110 dB down or greater, or 1.0 microvolt above the residual noise noted in step 2 above.

Step 7
Set the main tuning oscillator to 0.3 MHz. Set C2 and C4 in the second modulator to midrange. Tune the incremental tuning oscillator to 23, 54, 78.5 and 98.6 kHz. Check for spurious responses. Alternately adjust R3, C2 and C4 in the second modulator to bring the spurious responses to below –105 dB.

Step 8
Set the main tuning oscillator to 0.1 MHz and check for a spurious response between 53 and 57 kHz with the incremental tuning oscillator. Tune L2 in incremental reference oscillator slightly to minimize this spurious response.

Step 9
Tune the incremental oscillator slowly from 0 to 100 kHz. Check that all spurious responses are below –105 dB except 100 kHz which must be below 110 dB, or 1.0 microvolt above residual noise level noted in step 2 above.

7.29 **INPUT FILTER**

Step 1
Set the four coil slugs of the input LP filter 1/16" out from the fully IN position. (Only if the coil or other parts were replaced in the filter.)

Step 2
Tune the Signal Generator to 7.8 MHz, set output to –91.75 dB, terminate with 50Ω coaxial termination load at the voltmeter end of the cable and connect to the voltmeter input.

Step 3
Set the voltmeter attenuator to –90 dB, 75 ohm/BRG and tune in the 7.8 MHz signal. Adjust the CAL control for a panel meter reading of 0 dB.

NOTE: This adjustment may be done in "WIDE BAND" if drift is excessive.

Step 4
Tune the Signal Generator to approximately 21.1 MHz raise generator level 70 dB, and adjust L2 in the input lowpass filter for minimum reading on the voltmeter.

Step 5
Adjust L4 in the input lowpass filter to obtain a level of –71 dB difference between the voltmeter and the Signal Generator. Recheck and if necessary retune L2.

Step 6
Tune the Signal Generator to 15.1 MHz and adjust L3 in the input lowpass filter for maximum reading on the voltmeter.

Step 7
Recheck the frequencies of 21.1 MHz and 7.8 MHz for a –71 dB difference. Readjustment of L2 and L4 may be required.

MAIN TUNING OSCILLATOR, LOCKING AND TRACKING

7.30 For module location and waveforms refer to Figures 7-5, 7-7 and 7-8.

(a) Adjustments, Main Tuning Oscillator Locking

Step 1
Attach the probe of the RF Oscilloscope to J8. With plates of the main tuning capacitor fully meshed, frequency about 21 MHz, the voltage should be approximately 2.5 volts p-p. See Figure 7-5.

Step 2
Set MAIN TUNING mode to CONT. Set cursor index to midrange.

Step 3
Connect the frequency counter to J2.

Step 4
Set the tuning dial to 0.0 MHz and check that tuning capacitor is approximately 1/16" from full mesh.

Step 5
Adjust L1 on the main tuning oscillator until the counter reads approximately 21.1 MHz. (Tuning dial at 0.0 MHz.)

Step 6
Rotate the tuning dial to 15.0 MHz and adjust C8 until the counter reads approximately 36.1 MHz.

Step 7
Repeat steps 5 and 6 until counter readings are within ±10 kHz.

Step 8
Set MAIN TUNING mode switch to LOCK.

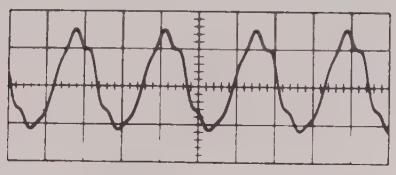
Step 9
Attach probe of oscilloscope to terminal 1 of T1 in the main tuning mixer and check the 100 kHz positive-going pulse. See Figure 7-5h. If no pulse is present, adjust L1 in the 100 kHz oscillator until a pulse of maximum amplitude is obtained.

Step 10
Switch power supply off and on several times to check for reliable starting of the oscillator. Slight readjustment of L1 may be necessary for reliable operation.

Step 11
Set the RF Oscilloscope as follows:

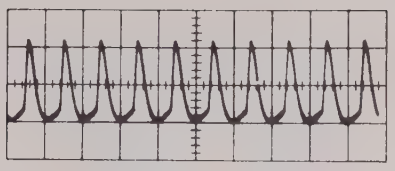
Vertical:	0.01 V/cm/AC
Horizontal:	0.05 μsec/cm
Sync:	EXT (+) AC

Use 10x probes for both vertical and sync. Calibrate the vertical channel and be sure the vertical probe is properly compensated. Use shortest possible ground leads and connect both ground leads to the same spot on the casting.



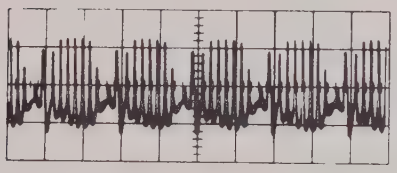
Vert: 1 V/cm
Hor: 20 nsec/cm
(581 Oscilloscope)

a. Main Tuning Oscillator output, capacitor plates fully meshed. Across 150 ohm dummy load connected to output of Main Tuning Follower output J8.



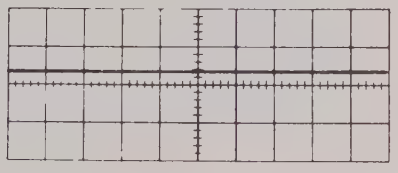
Vert: 1 V/cm
Hor: 10 usec/cm

b. Main Tuning Amplifier Detector output, collector of Q3. Locked waveform.



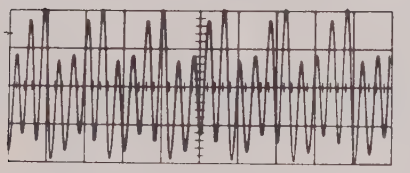
Vert: 1 V/cm
Hor: 50 usec/cm

c. Main Tuning Amplifier Detector output, collector of Q3. Unlocked waveform.



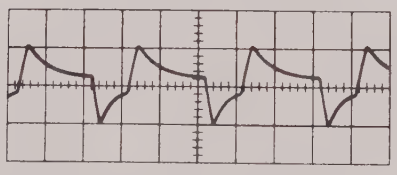
Vert: 2 V/cm
Hor: 50 usec/cm

d. 50 kHz Lowpass Filter output, Junction of L1, C1, C2, R2. Locked waveform.



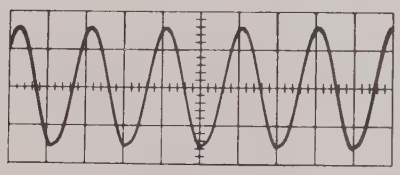
Vert: 2 V/cm
Hor: 50 usec/cm

e. 50 kHz Lowpass Filter output, junction of L1. C1, C2, R2. Unlocked waveform.



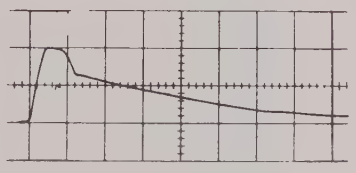
Vert: 2 V/cm
Hor: 10 usec/cm

f. Main Lock Indicator, junction of R5, R7, C4. Unlocked waveform.



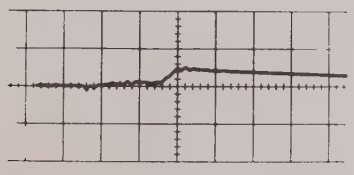
Vert: 1 V/cm
Hor: 5 usec/cm

g. 100 kHz Oscillator and Harmonic Generator, oscillator output, junction of C5, C6, C7.



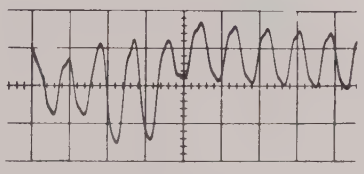
Vert: 0.5V/cm
Hor: 0.1 usec/cm
(581 Oscilloscope)

h. 100 kHz pulse input to Main Tuning Mixer



Vert: 0.1V/cm
Hor: 0.05 usec/cm
(581 Oscilloscope)

i. Main Tuning Mixer Output, Main Tuning Output disabled.



Vert: 0.1V/cm
Hor: 0.05 usec/cm
(581 Oscilloscope)

j. Main Tuning Mixer output. Arm of R10.

Figure 7-5. Main Tuning Module, Typical Waveforms

Step 12
Connect the vertical probe to C9 at the output of the main tuning mixer. Connect the sync probe to the junction of R14 and the emitter of Q4 in the 100 kHz oscillator and harmonic generator. Adjust the oscilloscope for a stable display.

Step 13
Set C3 in the main tuning mixer to mid-range. Disable the main tuning oscillator by holding a finger across the main tuning trimmer capacitor, C8.

Step 14
Adjust R10 in the main tuning mixer until the top of the first pulse in the oscilloscope display is parallel to the horizontal baseline, disregarding the small ripple present on the pulse. The top of the pulse may be either above or below the baseline, but the height above or below should not exceed 0.3 cm. The important characteristic is that the top of the pulse be horizontal, that is, parallel to the baseline. See Figure 7-5i.

Step 15
Adjust the oscilloscope display position so that the baseline to the left of the first pulse is exactly on a major graticule division. Adjust C8 in the main tuning mixer until the second pulse is 0.5 cm high in the positive direction. Remove the finger from the trimmer capacitor in the main tuning oscillator. See Figure 7-5j.

Step 16
Connect the vertical probe of the oscilloscope to TP6, at the rear of the module. Set the vertical sensitivity to 0.2V/cm, DC. Observe the locking action at 10 MHz. Locking is indicated by a DC trace, Figure 7-5d and the unlocked condition by an ac waveform, Figure 7-5e. If instability, ac or double lock points are observed, decrease the capacity of C3 in the main tuning mixer until they all disappear. If these conditions are not eliminated at the minimum setting of C3, the amplifier detector has too much gain and one or more of the transistors on that board should be replaced. If no instability or double locking occurs at the mid-range setting of C3, increase the capacity until instability occurs, then back off until stable operation is restored. If C3 must be changed appreciably the main tuning mixer must be reset, steps 14 and 15.

Step 17
Tune the main tuning dial over the frequency range and at each lock point make sure ac does not appear on the trace until the out-of-lock condition occurs.

Step 18
Fasten the side panels securely to the module. Connect the frequency counter to J2. Tune the frequency counter converter to 36.1 MHz. Set the voltmeter main tuning oscillator dial to the locked frequency position closest to the 15.0 MHz dial mark. Adjust C3 in the 100 kHz oscillator and harmonic generator until the counter reads 36.1 MHz ±10 Hz.

Step 19
Disconnect P8 from J8 and connect a 100 ohm dummy load to J8. Connect the high impedance probe of the RF microvoltmeter across the 100 ohm dummy load. Tune over the full range of the main tuning oscillator. Output at J8 should be 0.8V ±15%. Disconnect dummy load and reconnect P8.

(b) Main Tuning Oscillator Tracking

Step 1
Connect the frequency counter to J2 on the main tuning oscilaltor. Turn the MAIN TUNING mode switch to CONT.

Step 2
Check that the end frequencies are within ±10 kHz of 21.1 and 36.1 MHz (0.0 and 15.0 on the dial). If not refer to Paragraph (a) steps 5-7 above.

NOTE: Adjustments of the following two steps is necessary only after major parts replacement or major overhaul.

Step 3
Turn the MAIN TUNING mode switch to LOCK. Check the frequency locking at each megacycle mark and note the tuning dial settings. If all frequencies read either high or low on the dial, shift the dial disc by loosening its set screw to achieve an even reading distribution. Tighten setscrew after dial disc is shifted. Recheck (2) and readjust the end frequencies according to Paragraph (a) steps 5-7 if necessary.

Step 4
Starting at the high end check that frequency locking occurs in 100 kHz steps at each step within the width of the indicator slot. Adjust misalignments by slightly bending the outside capacitor plates. Access to the plates is through a hole in the top of the casting. Bend the outside plate at the point of mesh. If the dial frequency reads low, bend the plate inward. If the dial frequency reads high, bend the plate outward.

Step 5
Set the dial to exactly 1 MHz and note counter reading. Switch the MAIN TUNING mode switch to CONT. Adjust R2 on the MAIN TUNING switch until the counter reading in CONT position is within ±1 kHz of the counter reading in LOCK position.

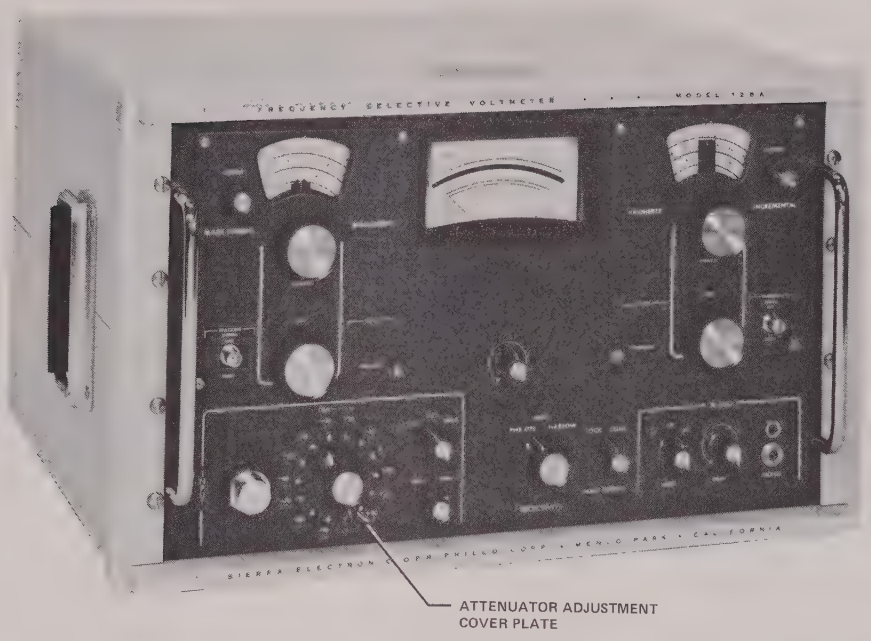


Figure 7-6. Front View, Module Location

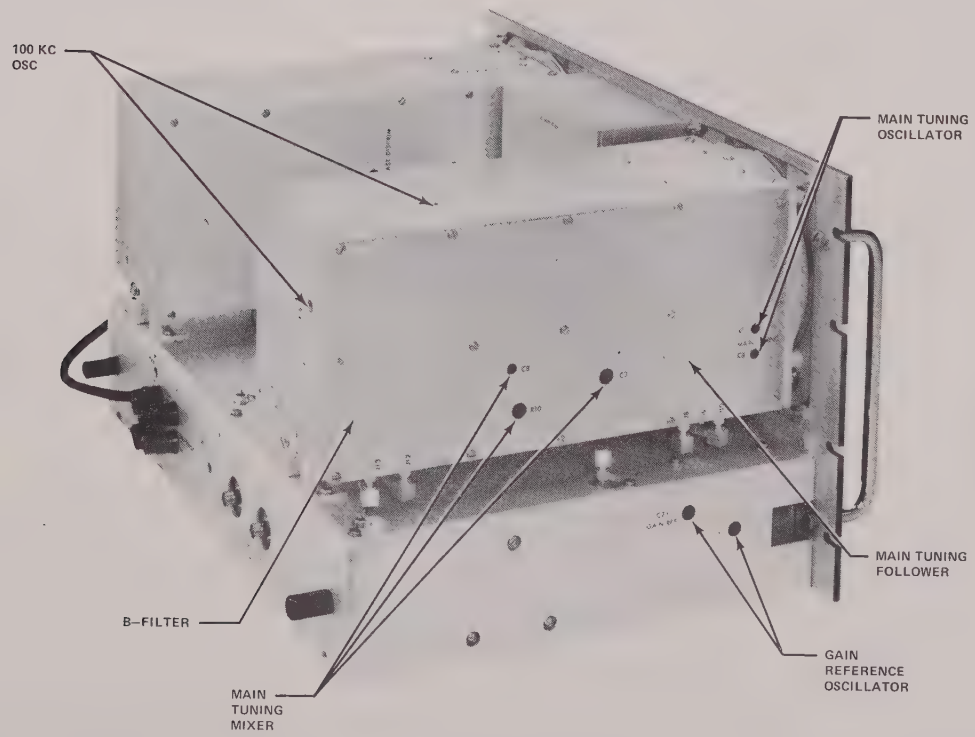


Figure 7-7. Left Side View, Module Location

INCREMENTAL TUNING OSCILLATOR, LOCKING AND TRACKING

7.31 (a) Preliminary Checks and Adjustments.

Step 1
Remove incremental oscillator from instrument to remove side covers. After side covers have been removed, temporarily reinstall the incremental oscillator.

Step 2
Connect a 100 ohm load to J20 on the second oscillator and attach the oscilloscope probe to J20. The voltage should be 2.1 volts p-p ±0.3V (Figure 7-8a). Then attach the counter in place of the probe and adjust L1 in the second oscillator for 18.8 MHz ±100 kHz.

Step 3
Attach the oscilloscope probe to terminal 1 of T1 in the incremental reference oscillator and mixer and check for approximately 4 volts p-p signal. See Figure 7-8b. If no signal is present, adjust L2 and C3 of the crystal oscillator circuit until the signal appears and adjust for maximum amplitude.

Step 4
Switch the power supply off and on several times to check for reliable starting of the oscillator. Slight readjustment of L2 may be necessary to assure proper operation.

Step 5
Attach the DC VTVM to the junction of C12 and R4 in the second oscillator. Adjust the varactor bias control, R8, on the casting floor behind the INCREMENTAL tuning oscillator until the voltage is –13.8 volts.

Step 6
With CURSOR control set the cursor line to the middle of the dot at the top of the bezel.

Step 7
Set the INCREMENTAL tuning dial to 100 kHz and check that the tuning capacitor is approximately 11/32" from full mesh.

Step 8
Connect frequency counter to TRACKING SIGNAL jack on the front panel.

Step 9
Set the tuning capacitor to read 100 kHz on the dial. Adjust L1 in the INCREMENTAL tuning oscillator until the counter reads 200 kHz ±20 Hz.

Step 10
Set the tuning capacitor to read 0 kHz on the dial. Adjust C6 in the INCREMENTAL tuning oscillator until the counter reads 300 kHz ±20 Hz. Repeat steps 9 and 10 until frequencies are within limits at both settings.

Step 11
Set R7, C10 and C14 in the INCREMENTAL reference oscillator and mixer to mid-range.

Step 12
Connect the frequency counter, using a X1 scope probe, to the junction of R8 and R9 in the incremental reference mixer. Remove Q1 in the second oscillator and adjust C3 in the incremental reference oscillator until the frequency counter reads 18.585 MHz ±10 Hz. Disconnect the counter.

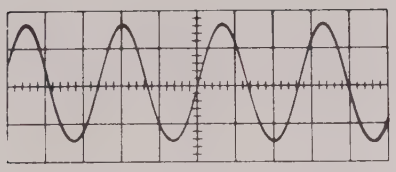
(b) Locking Adjustment

Step 1
Attach the scope probe to the output of the first LF amplifier (pin 3, T1 of phase discriminator) set the tuning dial to "O" kHz and with INCREMENTAL reference oscillator stopped, adjust R1 in the first LF amplifier for 6.2 ±0.2V p-p. Rotate the tuning capacitor through its range and observe the amplitude of the signal. If the amplitude varies more than 10%, change Q1 in INCREMENTAL tuning oscillator. If the positive peaks are distorted, change Q1, Q2, or Q3 in the first LF amplifier.

Step 2
Attach the scope probe to the output of the second LF amplifier, (pin 1, T2 of the phase discriminator) adjust R3 in the second LF amplifier for 2.0 ±0.2V p-p.

Step 3
Attach the scope probe to the output of the phase discriminator, scope set to maximum vertical sensitivity, with Q3 in the first LF amplifier pulled adjust R5, in the phase discriminator, for balance. (See Paragraph 7-8k for proper waveform). Reinstall Q3 in the first LF amplifier.

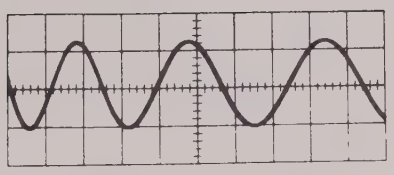
Step 4
Attach the scope probe to TP7, and connect a momentary pushbutton switch (N.O. contacts and short clip leads) to the input of the second LF amplifier (between junction of coaxial and CI and ground). Adjust L1 in the second oscillator until lock is obtained, (dc trace on scope, vertical input set to dc, 1V/cm horizontal to 1 μsec/cm), and dc trace moves in positive direction when dial frequency is advanced toward 100 kHz. Return dial to 5 kHz. Press pushbutton switch and note shift of dc trace. Release switch and further adjust L1 until no shift of dc trace is noted when pressing and releasing switch.



Vert: 2 V/cm

Hor: 20 nsec/cm

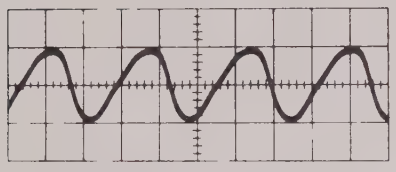
a. Second Oscillator output at J20.



Vert: 2 V/cm

Hor: 20 nsec/cm

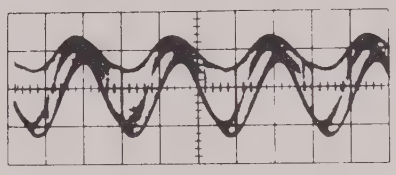
b. Incremental Reference Oscillator and Mixer, Crystal Oscillator output, terminal 2 of transformer T1. Second Oscillator disconnected.



Vert: 2 V/cm

Hor: 20 nsec/cm

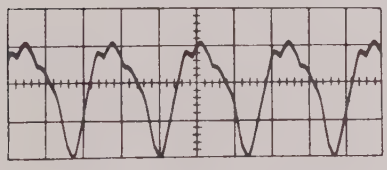
c. Incremental Reference Oscillator and Mixer, Second Oscillator input, terminal 4 of transformer T1.



Vert: 0.1 V/cm

Hor: 2 usec/cm

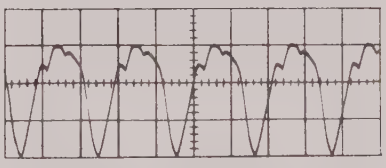
d. Incremental Reference Oscillator and Mixer output, arm of R7. Incremental Tuning Oscillator capacitor plates meshed.



Vert: 0.5 V/cm

Hor: 2 usec/cm

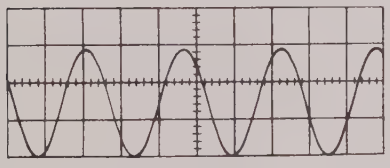
e. Second L.F. Amplifier output. Terminal 1 of transformer T2 in Phase Discriminator. Incremental Tuning Oscillator capacitor plates meshed.



Vert: 0.5 V/cm

Hor: 1 usec/cm

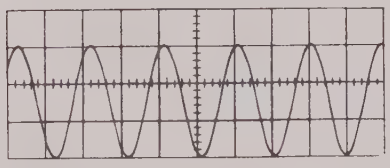
f. Second L.F. Amplifier output. Terminal 1 of transformer T2 in Phase Discriminator. Incremental Tuning Oscillator capacitor plates open.



Vert: 2 V/cm

Hor: 2 usec/cm

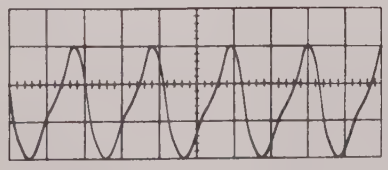
g. First L.F. Amplifier output. Terminal 3 of transformer T1 in Phase Discriminator. Incremental Tuning Oscillator capacitor plates meshed.



Vert: 2 V/cm

Hor: 2 usec/cm

h. First L.F. Amplifier output. Terminal 3 of transformer T1 in Phase Discriminator. Incremental Tuning Oscillator capacitor plates open.



Vert: 2 V/cm

Hor: 2 usec/cm

i. Phase Discriminator output, junction of CR1 and R6. Incremental Tuning Oscillator capacitor plates meshed.

Figure 7-8. Incremental Tuning Module, Typical Waveforms

Step 5
Set tuning dial to 75 kHz. If an unlocked condition is noted adjust R3, in the phase discriminator, until lock is obtained. Note position of dc trace on scope. Press switch and note shift of dc trace. Further adjust R3 until the trace moves to the position noted prior to pressing pushbutton and no shift of trace is seen when pressing and releasing switch.

NOTE: If total dc change, varying the dial from –10 kHz to 100 kHz, exceeds 5.0V, the varactor, CR1 in second oscillator, must be replaced.

Step 6
Repeat steps 4 and 5 until no further shift of dc trace occurs when pressing and releasing the pushbutton at the 5 kHz and 75 kHz points.

NOTE: Final adjustment for match may vary approximately 3-5 kHz from the 5 kHz and 75 kHz points in order to maintain less than 0.5V dc difference at points of maximum dc shift, (–10 kHz, ≈ 45 kHz, and 100 kHz). Check and record the final 5 kHz and 75 kHz dc voltages at TP7 using DVM (for reference steps 7 and 8).

Step 7
Check capture range. Connect oscilloscope and DVM to TP7. Set dial to the 75 kHz point. (Reference Paragraph f. above). Adjust L1 in second oscillator (CW) until lock is lost. **SLOWLY** readjust in CCW direction until lock is **just** obtained. Note voltage on DVM. Further adjust L1, (CCW), until lock is again lost. **SLOWLY** readjust L1 in CW direction until lock is **just** obtained. Note voltage on DVM. The difference in voltages noted should be between 1.8V and 2.3V with approximately equal distribution about the reference voltage noted in step 6. If difficulty is encountered check steps 2 and 3 for proper settings. Readjust L1 for reference voltage as noted in step 6.

Step 8
With dial set to the 75 kHz reference point (step 6), connect the counter to J3, input tracking and the DVM to TP7. Note the exact frequency and the reference voltage. Install side covers, retune dial for the frequency noted and adjust L1 in the second oscillator for the dc reference voltage. Recheck the 5 kHz and 75 kHz points to verify that the alignment, as recorded in step 6, did not change.

Step 9
Apply and remove –15 Vdc to input jack (J3) at each 10 kHz step to ensure that unlocking and relocking occurs.

(c) Tracking Adjustment

Step 1
Connect the AC VTVM to the TRACKING SIGNAL input jack, J3, on the INCREMENTAL tuning dial plate, and connect the Frequency Counter to the AC VTVM amplifier output. If the Frequency Counter has sufficient sensitivity, the AC VTVM amplifier may be omitted.

Step 2
Set the tuning capacitor to read 100 kHz on the INCREMENTAL tuning dial with cursor set to reference dot on top of dial bezel. Adjust L1 in the INCREMENTAL tuning oscillator until the counter reads 200 kHz.

Step 3
Set the INCREMENTAL tuning capacitor to read 0 on the tuning dial. Adjust C6 in the INCREMENTAL tuning oscillator until the Counter reads 300 kHz.

Step 4
Repeat steps (2) and (3) until both frequencies are within ±20 Hz.

Step 5
Starting at the high end, check in 10 kHz steps that the 300 and 200 kHz readings (0 kHz and 100 kHz dial setting) are within ±20 Hz and all other readings are within ±200 Hz of each corresponding dial setting. Each setting should be rocked into place with back and forward movements of the tuning knob to eliminate backlash irregularities.

NOTE: Unless misalignment is serious the following two steps should be omitted.

Step 6
Note the tuning dial settings at all frequency points. If all frequencies read either high or low on the dial, shift the capacitor by loosening the set screw in the coupling to achieve even reading distribution. Recheck and readjust as necessary the settings of steps 2 through 6.

Step 7
Adjust incorrect readings by slightly bending the tuning capacitor plates. Access to the plates is through the top hole of the casting. Bend the outside plate at the point of mesh. If the dial frequency reads low, bend the plate outward. If the dial frequency reads high, bend the plate inward.

7.32 METER LINEARITY

Step 1
Turn off power to the voltmeter and check that the mechanical zero adjustment of the meter is set properly. Switch voltmeter back on after checking zero adjustment.

Step 2
Connect the audio oscillator to the input of the Attenuation Network and the output of the Attenuation Net-

work to the input of the Voltmeter. Set Attenuator Network for 12 dB attenuation. Set the voltmeter attenuator to –10 dB, 600 ohms/TERM, and SELECTIVITY switch to NARROW.

Step 3
Set the Audio Oscillator to 100 kHz tune in the signal with the voltmeter and set Audio Oscillator for a 0 dB reading on the voltmeter panel meter.

Step 4
Adjust the Attenuation Network for voltmeter panel meter readings of +2, +2, –1, –2, –3, –4, –5, –6, –7, –8, –9, –10, –15 and –20 dB. Note difference between meter reading and the value of the attenuation switched out or in. Limit: +2 to –10 dB ±0.2 dB, –15 dB ±0.5 dB, –20 dB ±1.0 dB. R1 in series with RECORDER OUTPUT jack may be selected to obtain best linearity. Value of R1 should not exceed 15K ohms.

7.33 ATTENUATOR CALIBRATION AND GAIN REFERENCE OSCILLATOR

Step 1
Connect the Signal Generator to the VHF Attenuator and connect the AC VTVM to the Signal Generator output. Connect the VHF Attenuator to the voltmeter and terminate the voltmeter input with a 50 ohm coaxial termination load.

Step 2
Switch the VHF Attenuator to the 100 dB position. Set the Signal Generator to 1 MHz and adjust the output to read 0.866 volts on the AC VTVM. Set the voltmeter attenuator to –90 dB, 75 ohm/BRG and the SELECTIVITY switch to NARROW. Keep the reading on AC VTVM constant at 0.866V for all measurements in steps 3 through 11. Keep signal centered in narrow band filter.

Step 3
Tune the voltmeter to 1 MHz and adjust the CAL control to midrange. Set R19 in the output amplifier for a voltmeter panel meter reading of 0 dB.

Step 4
Switch the voltmeter attenuator to –80 dB, the VHF Attenuator to the 90 dB position and check that the panel meter again reads 0 dB. If it does not, readjust R4 in the output amplifier for a 0 dB reading.

Step 5
Set voltmeter impedance switch to 135 ohm/BRG. Adjust C29 to reduce reference reading (–80 dB) by 2.56 dB to –82.56 dB if necessary.

Step 6
Set voltmeter impedance switch to 600 ohm/BRG. Adjust C31 to reduce reference reading (–80 dB) by 9.04 dB to –89.04 dB if necessary.

Step 7
Set the voltmeter attenuator to 0 dB position. Set the voltmeter impedance switch to 135 ohm/BRG. Increase the VHF Attenuator output by 80 dB to the 0 dB position. Adjust the 0 dB attenuator trimmer to read 2.56 dB below reference as in step 5. (Access to the attenuator trimmer capacitors is obtained by removing the cover plate under the attenuator knob. The plate is held by two screws which are accessible when the attenuator knob is removed. Each trimmer is located under the corresponding panel dB marking.)

Step 8
Switch the voltmeter impedance switch to 75 ohm/BRG. Adjust C27 to obtain the exact 0 dB reference reading.

Step 9
Switch the attenuator to CAL and tune the voltmeter for a maximum meter indication of the internal 1 MHz calibration signal. Adjust C23 in the attenuator for an exact 0 dB meter reading.

Step 10
Switch the VHF attenuator to 80 dB and the voltmeter attenuator to –70 dB, 75 ohm/BRG. Adjust the –70 dB attenuator trimmer for a 0 dB meter reading.

Step 11
Proceed for all attenuator steps, simultaneously decreasing the VHF Attenuator and the voltmeter attenuator positions by 10 dB and adjust each attenuator trimmer for a 0 dB meter reading to and including the +10 dB position.

Step 12
Connect the Audio Oscillator and the AC VTVM to the input of the Attenuator Network. Connect the output of the Attenuator Network to the voltmeter input with a 600 ohm external terminating resistor (metal film type). Set the voltmeter attenuator to 0 dB, 75 ohm/BRG and SELECTIVITY switch to NARROW.

Step 13
Set the Attenuator Network for 20 dB attenuation. Set the Audio Oscillator to 500 kHz and adjust the output to read exactly 8.66 volts on the AC VTVM. Keep this level constant for all the measurements of steps 14 through 16.

Step 14
Tune the voltmeter to read maximum at 500 kHz and adjust the CAL control for an exact 0 dB reading on the panel meter.

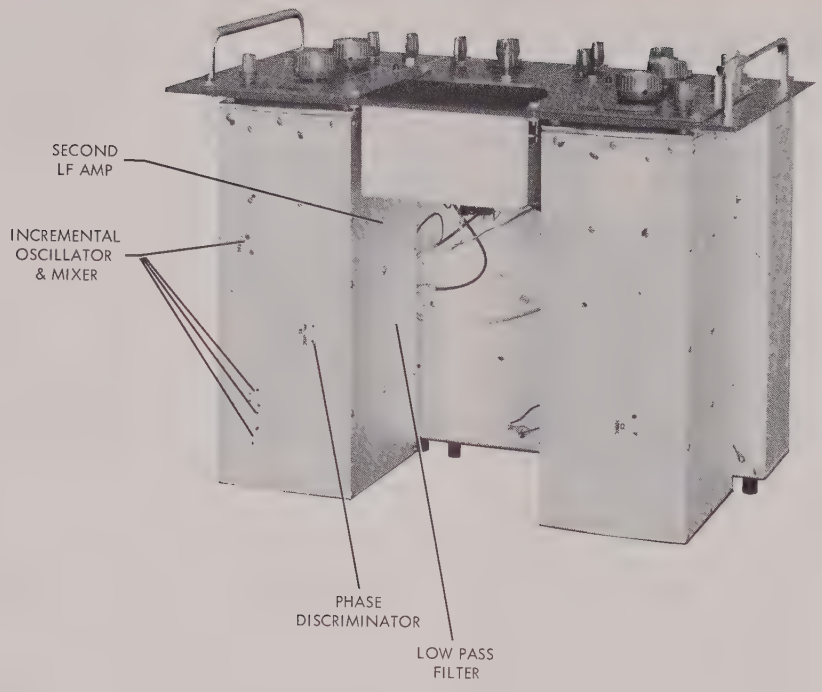


Figure 7-9. Top View, Module Location

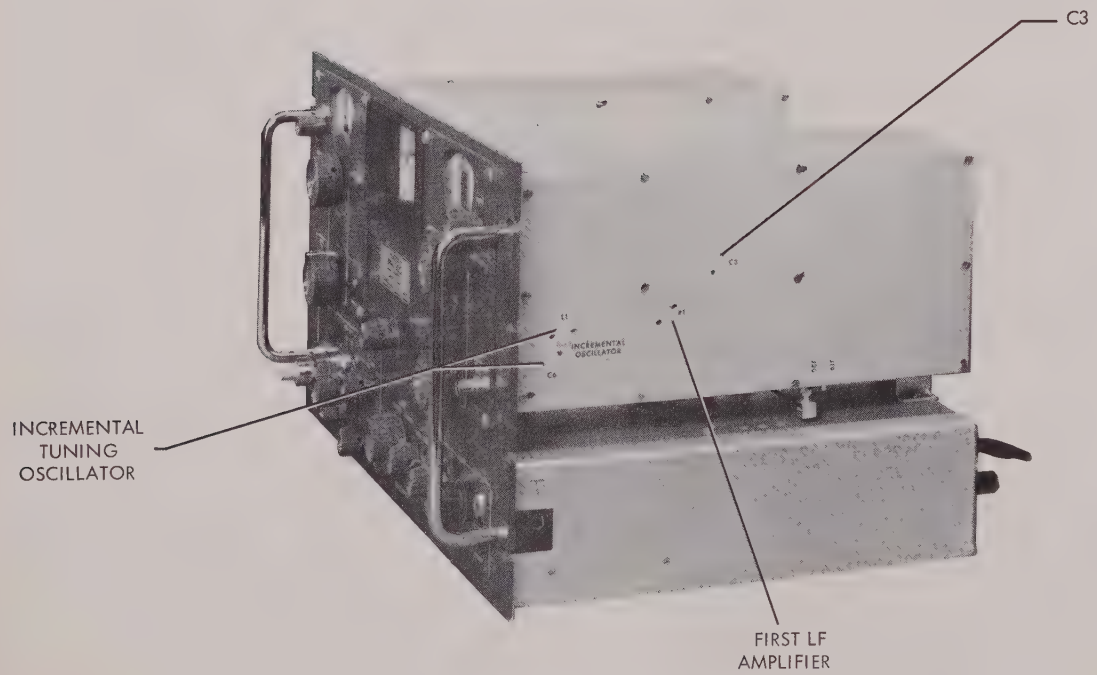


Figure 7-10. Right Side View, Module Location

Step 15
Switch the voltmeter attenuator to +10 dB and the Attenuator Network to 10 dB. Check that the voltmeter reading in this position is the same as the reading obtained at 1 MHz in step 11.

Step 16
Switch the voltmeter attenuator to +20 dB and +30 dB and the Attenuator Network to 0 dB and adjust the voltmeter attenuator trimmers for a 0 dB reading on the meter at +20 dB, −10 dB reading at +30 dB, taking meter linearity into account.

7.34 110 KHZ BANDPASS FIRST IF T IF

CAUTION: No change in this adjustment should be made unless it is definitely determined that the bandpass characteristic is not maximally flat. See check in Paragraph 7.26. If error is small omit step 1 below and perform steps 2 through 9.

Step 1
Attenuator to CAL, SELECTIVITY to NARROW with MAIN TUNING control set to 1.0 MHz, INCREMENTAL control set to 0.0 and MAIN TUNING switch to LOCK or CONT. position, tune inductors L5, L6, and L7 on the first IF board for a peak on the panel meter.

NOTE: Inductors L5 and L7 tune out, and inductor L6 usually tunes in.

Step 2
Tune CAL control for a 0 dB indication on the panel meter.

Step 3
Tune to 0.9 MHz with MAIN TUNING control. Peak meter with INCREMENTAL control at 100 kHz.

Step 4
Tune inductor L5 for equal indication (±0.1 dB) at 1.0 MHz, O kHz and at 0.9 MHz and 100 kHz on panel meter.

Step 5
Tune INCREMENTAL control to 50 kHz and retune MAIN TUNING control to peak the panel meter. (Fine peaking may be done with INCREMENTAL control.)

Step 6
Adjust inductor L6 to halve the error on the panel meter.

Step 7
Recheck at 0 and 100 kHz points. Very minutely, adjust inductor L7 to equalize indications.

Step 8
Repeat steps 2 through 6 until all readings are within 0.1 dB of each other. Do not adjust any inductor more than 1/16 turn henceforth.

Step 9
Check level readings at 10 kHz intervals. All readings shall be within ±0.1 dB of 1 MHz CAL. (This check must be done in CONT mode in order to set MAIN TUNING control to within 10 kHz of the 100 kHz lock points.)

7.35 FREQUENCY RESPONSE CHECK

Step 1
Connect the RF Signal Generator and the RF Microvoltmeter to the input of the voltmeter. The 50 ohm probe of the Microvoltmeter serves as the termination for the connecting cable. The RF Microvoltmeter connection must be at the voltmeter input. (The frequency response accuracy of the RF Microvoltmeter should be 1% or better over the frequency range used.)

Step 2
Set the voltmeter attenuator to 0 dB, 75 ohm/BRG, SENSITIVITY to NARROW, MAIN TUNING mode to LOCK, MAIN TUNING dial to 1.0 locked and INCREMENTAL tuning dial to 0.0 kHz.

Step 3
Tune the RF Signal Generator for a maximum indication on the voltmeter at 1 MHz and set for an exact 0 dB reading. Note the reading of the RF Microvoltmeter and adjust the RF Signal Generator to this reading at each frequency setting in the following procedure.

Step 4
Note the reading of the voltmeter panel meter at 10 kHz, 100 kHz, 1 MHz, 5 MHz, 10 MHz, 13 MHz, and 15 MHz. The Audio Oscillator may be used in place of the Signal Generator for the 10 kHz reading.

Step 5
Adjust C8 in the preamplifier and L3 in lowpass filter, if necessary, to bring this reading within the limits given below. Best flatness generally results if C8 is set for +0.1 dB at 10 MHz, L3 for +0.1 dB at 15 MHz.

Limits for steps 4 and 5 are:

100 kHz to 10 MHz ±0.2 dB
10 kHz to 15 MHz ±0.5 dB

7.36 0 dB CALIBRATION

Step 1
Connect the RF Signal Generator to the voltmeter and terminate cable with 50 ohms at the voltmeter INPUT. Connect the AC VTVM also across the voltmeter INPUT.

Step 2
Set the voltmeter attenuator to 0 dBm, 75 ohm/BRG, SELECTIVITY to NARROW, MAIN TUNING mode to LOCK, MAIN TUNING dial to 1.0 MHz, locked, and INCREMENTAL tuning to 0.0 kHz.

Step 3
Carefully tune the RF Signal Generator for maximum indication of the voltmeter and set the output to exactly 0.274 volt as read on the AC VTVM. (The AC VTVM accuracy must be 1% or better.)

Step 4
Set the voltmeter CAL control for a reading of exactly 0 dB.

Step 5
Switch the voltmeter attenuator to CAL and tune the INCREMENTAL dial for maximum indication. Reading should be 0 dB. If not, reset C23 in the attenuator for 0 dB and repeat steps 3, 4 and 5.

Step 6
Set the voltmeter attenuator to 0 dBm, 135 ohm/BRG, set the output of the RF Signal Generator to exactly 0.367 volt as read on the AC VTVM, and carefully tune the INCREMENTAL dial for maximum indication. The voltmeter reading should be 0 dB ±0.1 dB. If limit is exceeded, readjust C29 in the attenuator.

Step 7
Set the voltmeter impedance selector to 600 ohms/BRG, set the output of the RF Signal Generator to exactly 0.775 volt as read on the AC VTVM and tune INCREMENTAL dial for maximum indication. The voltmeter reading should be 0 dB ±0.1 dB. If limit is exceeded readjust C31 in the attenuator.

Step 8
If more than a slight readjustment of C20 and C31 is required, repeat the procedure of Paragraph 7.33 steps 1 through 16, and then repeat steps 1 through 7 of the paragraph.

7.37 FINAL CHECK

a. Carry out the complete procedure of Paragraphs 7.12 through 7.18. General Specifications Check.

TRACKING WITH SIERRA 351A SIGNAL GENERATOR

7.38 The following tracking procedure assumes that the 128A is properly aligned, with the gain reference and local oscillator frequencies within the required tolerances.

Step 1
Set the 128A attenuator to CAL, 75 ohms/TERM, SELECTIVITY to NARROW, MAIN TUNING mode to LOCK, MAIN TUNING dial to 1.0 MHz, locked, and tune the INCREMENTAL tuning dial for the precise maximum meter reading. Set the CAL control for an exact 0 dB reading.

Step 2
Connect one of the 93 ohm (RG-62/U) cables provided between the TRACKING SIGNAL KHZ connectors, J3, on the 128A Voltmeter and the Sierra 351A Signal Generator INCREMENTAL tuning panels. This connection disconnects the second local oscillator of the 128A and injects the second local oscillator frequency of the 351A in its place. The LOCK indicator lamp on the INCREMENTAL tuning panel of the Model 128A may go out momentarily, but should come back on within a fraction of a second. Check at every 20 kHz point over the full range of the Model 351A INCREMENTAL tuning dial that the indicator lamp stays on. If necessary, readjust R8 varactor bias control per step 5 of Paragraph 7.31.

Step 3
Set the Model 351A INCREMENTAL tuning dial to approximately 0 kHz and tune very carefully for an exact maximum reading on the Model 128A meter. This reading should be exactly 0 dBm as set in step 1 above. Set the Model 351A CURSOR to 0 kHz on the INCREMENTAL tuning dial.

Step 4
Set the Model 351A MAIN TUNING dial to 1.0 MHz, locked.

Step 5
Connect the other 93 ohm cable (RG-62/U) between the TRACKING SIGNAL MHZ connectors, J2, on the Model 128A Voltmeter and the Model 351A Signal Generator MAIN TUNING panels. The LOCK indicator lamp on the Model 128A will remain on. This connection disconnects the first local oscillator of the Model 128A and injects the first local oscillator frequency of the Model 351A in its place.

Step 6
The meter reading on the Model 128A should now be peaked by adjusting C3 of the Model 351A 100 kHz Oscillator and Harmonic Generator in the Main Tuning casting. C3 is accessible through the top of the casting, Figure 4-1 (100 kHz oscillator). The meter reading should be 0 dBm ±0.05 dB. If this limit is exceeded, adjust the tracking level control, R1, in the Model 351A main tuning casting, Figure 7-2, until the Model 128A meter reads 0 dBm ±0.5 dB.

Step 7

Set the Model 128A attenuator to 0 dBm, 75 ohm/TERM. Set the Model 351A Output IMPEDANCE switch to 75 ohms, the attenuator to 0 dBm and adjust the LEVEL control for a 0 dB reading on the meter. Connect a 75 ohm cable (RG-59A/U) between the OUTPUT of the Model 351A and the INPUT of the Model 128A.

Step 8

The meter reading of the Model 128A should now be peaked by adjusting C9, frequency trimmer, of the Model 351A Incremental Reference Oscillator (20.8 MHz crystal), in the side of the incremental tuning casting, Figure 7-3 (incremental oscillator). After the reading is peaked, adjust the Model 128A CAL control for a 0 dBm reading on the Model 128A meter.

Step 9

Run the Model 351A Signal Generator MAIN TUNING dial through its tuning range. Variation in level readings between the two instruments may be as much as ±0.5 dB. If larger variations are noted, readjust the tracking level control, R1, in the Model 351A, Figure 7-2, to obtain the minimum variation over the tuning range.

SECTION 8
REPLACEABLE PARTS LIST

INTRODUCTION

8.01 This section contains a complete list of those replaceable electrical components, and some mechanical parts. No attaching hardware, wire, fabricated chassis, or unassembled printed circuit boards are listed.

8.02 Standard components have been used in this instrument whenever possible. Both standard and special components may be ordered direct from the factory. When ordering parts always include:

1. Sierra stock number.
2. Circuit reference designation and commercial description.
3. Name, model and serial number of the instrument.

8.03 Parts for this instrument or further service information may be obtained from:

SIERRA ELECTRONIC OPERATION
Philco-Ford Corporation
3885 Bohannon Drive
Menlo Park, California 94025
Telephone (415) 322-7222
TWX 910-373-1282

8.04 The parts are listed in reference designation order by assembly. Each of the printed circuit assemblies are listed in the breakdown for the main assembly, and shown in detail in order of their reference designation.

8.05 The column entitled "EFFECTIVITY CODE" will be used when there is a modification to future manufacturing runs of this instrument. This manual applies to the Sierra 128A instruments bearing serial numbers 1803 and up. Earlier instruments use different manuals.

8.06 The column marked "FMC" shows the manufacturer's code number as obtained from the federal supply code for manufactuere's, catalog H4-1. Manufacturer's codes used in this publication are listed in Table 8-1.

Table 8-1. Manufacturer's Supply Codes

Code	Manufacturer's Name and Address
00656	Aerovox Corp., 740 Belleville Ave., New Bedford, Mass. 02741
00779	Amp, Inc., P.O. Box 3608, Harrisburg, Pa. 17105
01002	General Electric Co., Industrial & Power Capacitor Dept., John St., Hudson Falls, N.Y. 12839
01121	Allen-Bradley Co., 1201 S. 2nd St., Milwaukee, Wis. 53204
01281	TRW Semiconductors Inc., Lawndale, California
04713	Motorola, Inc., Semiconductor Products Div., 5005 E. McDowell Rd., Phoenix, Ariz. 85008
01961	Pulse Engineering Inc., 560 Robert Ave., Santa Clara, Calif 95050
07236	National Lock Washer Division, Charter Wire Co., 241 Erie Street, Milwaukee, Wis. 53202
07263	Fairchild Semiconductor, A Division of Fairchild Camera and Instrument Corp., 464 Ellis St., Mountain View, Calif. 94040
07623	Eck and Krebs Inc., 27–09 40th Ave., Long Island City, N.Y. 11101
08307	Aladdin Electronics/Skyborne Division of Aladdin Industries Inc., 9841 Alburtis Ave., Santa Fe Springs, California 90670
09133	Kierulff Electronics Inc., 2585 Commerce Way, Los Angeles, Calif. 90015
09231	General Electric Co., Semiconductor Products Dept. 1495 Fillmore Ave., Buffalo, N.Y.

Table 8-1. Manufacturer's Supply Codes (Cont)

Code	Manufacturer's Name and Address
12289	Centralab, Canada Ltd., Ajax, Ontario, Canada
12294	Erie Technological Products of Canada, Ltd., Trenton, Ontario, Canada
13165	Wright Mfg. Co., 411 N. 3rd St., Memphis, Tenn. 38105
15849	USECO Inc., Mt. Vernon, New York
18762	Superior Fuse and Mfg Co., Inc., 120 Leuning Street, South Hackensack, New Jersey 07606
19701	Electra/Midland Corp., P.O. Box 760, Mineral Wells, Tex. 76067
23095	Aztec Electronics, Inc., 163 Liberty Ave., Anaheim, Calif. 92801
24655	General Radio Co., 22 Baker Avenue, West Concord, Mass. 01781
28480	Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif. 94304
31550	ITT Aerospace/Optical Division of International Telephone and Telegraph Corp., 3700 East Pontiac Street, Fort Wayne, Ind. 46803
49956	Raytheon Co., Lexington, Mass. 02173
56289	Sprague Electric Co., North Adams, Mass. 01247
71279	Cambridge Thermionic Corp., 445 Concord Ave., Cambridge, Mass. 02138
71450	CTS Corp., 1142 Beardsley Ave., Elkhard, Ind. 46514
71590	Globe Union, Inc., Centralab Division, P.O. Box 591, Milwaukee, Wis. 53201
72136	Electro Motive Mfg. Co. Inc., The South Park and John Streets, Willmantic, Conn. 06226
72259	Nytronics Inc., 10 Pelham Parkway, Pelham Manor, N.Y. 10803
72928	Gudeman Division of the Gulton Industries Inc., 340 W. Huron St., Chicago, Ill. 60610
72982	Erie Technological Products, Inc., 644 W. 12th St., Erie, Pa. 16512
73138	Beckman Instruments Inc., Helipot Division, 2500 Harbor Blvd., Fullerton, Calif. 92634
73899	J F D Electronics Corp., 15th at 62nd Street, Brooklyn, N.Y. 11219
74370	Birtcher Corp., The Instrument Division, 1200 Monterey Pass Road, Monterey Park, Calif. 91754
74970	E.F. Johnson Co., 299 10th Ave., S.W., Waseca, Minn. 56093
75915	Littelfuse, Inc., 800 E. Northwest Hwy., Des Plaines, Ill. 60016
76055	Mallory Controls Div. of Mallory PR and Co. Inc., State Rd 28W, Frankfort, Ind.
76487	Millen James Mfg Co., Inc., 150 Exchange Street, Malden, Mass. 02148
76493	Miller J W Company, P.O. Box 5825, 19070 Reyes Ave., Compton, Calif. 90024
77969	Rubbercraft Corp. of California Ltd., 1800 W. 20th St., Torrance, California 90507
78277	Sigma Instrument Inc., 170 Pearl Street, South Braintree, Mass 02185
79136	Waldes Kohinoor Inc., 47–16 Austel Place, Long Island City, N.Y. 11101
80583	The Hammarlund Mfg. Co., Inc., 73–88 Hammarlund Dr., Mars Hill, N.C. 28754
81073	Grayhill Inc., 561 Hillgrove Ave., La Grange, Ill 60525
82142	Airco Speer Electronic Components, P.O. Box 487, Hoover Ave., Du Bois, Pa. 15801
81349	Military Specifications Promulgated by Standardization Div. Directorate of Logistics Services DSA
81438	Tex Tan Western Leather Co., P.O. Box 711, Yoakum, Texas 77995
81483	International Rectifier Corp., 9220 Sunset Blvd., Los Angeles, Calif. 90069
82389	Switchcraft Inc., 5555 N. Elston Ave., Chicago, Ill. 60630
82484	Sprague Devices, Inc., Huron and Frank St., Michigan City, Ind. 46360
83014	Hartwell Corp., 9035 Venice Blvd., Los Angeles, Ca., 90034
83100	Paragon Moulded Plastics Inc., 1422 Seneca, Seattle, Washington 98101
83330	Herman H. Smith, Inc., 812 Snediker Ave., Brookly, N.Y. 11207

Table 8-1. Manufacturer's Supply Codes (Cont)

Code	Manufacturer's Name and Address
88822	Regan Forge and Engineering Co., P.O. Box 150, San Pedro, Calif. 90733
91506	Augat Inc., 33 Perry Ave., Attleboro, Mass. 02703
91737	ITT Gremar Inc., 10 Micro Dr., Woburn, Mass 01801
94668	Philco-Ford Corp., Sierra Electronic Operation, 3885 Bohannon Dr., Menlo Park, Calif. 94025
96214	Texas Instruments, Inc., Gov't Products Division of Equip. Group, 13510 N. Central Expressway, P.O. Box 6015, Dallas, Tex. 75222
99800	Delevan Div. American Precision Industries Inc., 270 Quaker Road, East Aurora, N.Y. 14052

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	SIERRA 128A FREQUENCY SELECTIVE VOLTMETER	A02390600				
	OSCILLATOR KHZ SUBASSEMBLY	A02063500	94668	A02063500	REF	
	MAIN TUNING OSCILLATOR SUBASSEMBLY	A02063600	94668	A02063600	REF	
	CHASSIS-PANEL	A02390500	94668	A02390500	1	
	GUIDE,CHASSIS	B02284400	94668	B02284400	2	
	COVER,AUDIO	C01894200	94668	C01894200	1	
	CABINET,RRC	D02283000	94668	D02283000	1	
	RESISTOR,FXD,COMPOSITION,FACTORY SELECT	906900XXX	94668	906900XXX	1	
	CONNECTOR,ADAPTER TO BNC	914600089	24655	874-QBJL	1	
	CHASSIS-PANEL	A02390500	94668	A02390500		
	SELECTIVITY FILTER	A02384800	94668	A02384800	1	
	SHIELD	B01893300	94668	B01893300	1	
	CABLE ASSEMBLY	B01987800	94668	B01987800	2	
	CABLE ASSEMBLY	B01987801	94668	B01987801	1	
	CABLE ASSEMBLY	B01987802	94668	B01987802	1	
	MAIN TUNING SWITCH ASSEMBLY	B02001500	94668	B02001500	REF	
	POWER SUPPLY	B02051200	94668	B02051200	REF	
	CABLE ASSEMBLY	B02051902	94668	B02051902	1	
	CABLE ASSEMBLY	B02051903	94668	B02051903	2	
	CABLE ASSEMBLY	B02052001	94668	B02052001	1	
	CABLE ASSEMBLY	B02052003	94668	B02052003	1	
	CABLE ASSEMBLY	B02084501	94668	B02084501	2	
	CABLE ASSEMBLY	B02084502	94668	B02084502	1	
	SWITCH,ROTARY	B02386100	94668	B02386100	1	
	SHIELD,PREAMPLIFIER	C01824000	94668	C01824000	1	
	COVER,METER SHIELD	C01863400	94668	C01863400	1	
	OUTPUT AMPLIFIER	C02051000	94668	C02051000	REF	
	AUDIO SUBASSEMBLY	C02051100	94668	C02051100	REF	
	CHASSIS	D01863000	94668	D01863000	1	
	PANEL,FRONT	D01906500	94668	D01906500	1	
	ATTENUATOR ASSEMBLY	D01987000	94668	D01987000	1	
	MIXER MODULE SUBASSEMBLY	D02050100	94668	D02050100	1	
	CAPACITOR,FEED THRU,1000PF,200V,WITH HARDWARE	902640102	72928	1201-052	5	
	METER,AMP,200 MICRO AMP DC,MIRROR SCALE	911800060	94668	911800060	1	
	RELAY,SINGLE POLE DOUBLE THROW 1500 OHMS, 5.8 MA,PRINTED CIRCUIT BOARD MOUNTING	912600026	78277	11FP-1500G-PAL	1	
	FUSE,SLO-BLO,1/4 AMP,125V	913200033	75915	313-2503AG	1	
	FUSE,0.5AMP	913200036	75915	312-5003AG	1	
	FUSEHOLDER	913400014	75915	342004	2	
	JACK,PHONE,3/8 BUSHING,SINGLE CIRCUIT, NORMALLY CLOSED	914400016	82389	L12A	1	
	CONNECTOR,SOLDER RECEPTACLE,MINIATURE	914600099	00779	329852	1	
	CONNECTOR,90 ADAPTER,SUB MINIATURE	914600101	00779	329097	13	
	INSULATOR,STANDOFF	915100010	71279	3650-1	1	
	BINDING POST,RED	915200008	18762	DF-30RC	1	
	BINDING POST	915200009	94668	915200009	1	
	CLAMP,CABLE,PLASTIC,3/8 DIAMETER	915300033	94668	915300033	1	
	GROMMET,1/2 INCH HOLE,3/8 INCH ID	915400002	77969	7	1	
	GROMMET,7/8 INCH HOLE,5/8 INCH ID	915400016	83330	2187	1	
	KNOB,BROWN	916000085	13165	916000085	2	
	KNOB,BROWN	916000090	13165	916000090	6	
	BEARING,FOR 1/8 IN.SHAFT	916100001	74970	115-255	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	LINE CORD,WITH MOULDED PLUG,3/18 CONDUCTOR, 8 FEET LONG	916400017	94668	916400017	1	
	BUSHING,STRAIN RELIEF	916600006	94668	916600006	1	
	HANDLE	918100016	83014	5012-56-27-1B	2	
	CASTING METER,BEZEL	920500053	94668	920500053	1	
	MIXER MODULE SUBASSEMBLY	D02050100	94668	D02050100		
	COVER,FIRST MIXER	B01881700	94668	B01881700	1	
	COVER,SECOND MIXER	B01881800	94668	B01881800	1	
	FIRST MIXER	B02050200	94668	B02050200	REF	
	FIRST MODULATOR	B02050300	94668	B02050300	REF	
	SECOND I.F.	B02050500	94668	B02050500	REF	
	IF AMPLIFIER AND INCREMENTAL MIXER ASSEMBLY	B02326800	94668	B02326800	REF	
	SECOND MODULATOR	B02327100	94668	B02327100	REF	
	MACHINING,MIXER MODULE	D01820600	94668	D01820600	1	
	CAPACITOR,FXD,CERAMIC,27 PF,PORM 2 PCT,NPO	901400270	72982	901400270	3	
	CAPACITOR,FXD,CERAMIC,0.68 PF,PORM 0.10 PF, 500 V,AXIAL LEADS	901410068	00656	CC21CKR68B	2	
	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
	CAPACITOR,FXD,MICA,10 PF,PORM 5 PCT, 500 V,SILVER	902010100	72136	CM15C100J	1	
					2	
	CAPACITOR,FXD,MICA,100 PF,PORM 5 PCT, 500 V,SILVER	902010120	72136	CM15C120J	1	
	CAPACITOR,FXD,MICA,39 PF,PORM 5 PCT, 500 V,SILVER	902010390	72136	CM15E390J	1	
	CAPACITOR,FXD,MICA,5 PF,PORM 10 PCT, 500V,SILVER	902040050	72136	CM15C050K	1	
	CAPACITOR,FXD,MICA,82 PF,PORM 2 PCT 500 V,SILVER	902050820	72136	CM15E820G	1	
	CAPACITOR,FXD,MICA,220 UUF,PORM 2 PCT, 500 V,SILVER	902070221	72136	CM15E221G	1	
					3	
	CAPACITOR,FXD,MICA,50 PF,PORM 2 PCT, 500 V,SILVER	902070500	72136	902070500	1	
	CAPACITOR,FEED THRU,1000PF,200V,WITH HARDWARE	902640102	72928	1201-052	2	
	CONNECTOR,BNC,FEMALE	914600035	91737	UG-1094/U	2	
	CONNECTOR,SOLDER RECEPTACLE,MINIATURE	914600099	00779	329852	2	
	INSULATOR,FEED-THRU	915100029	94668	915100029	1	
L1	INDUCTOR,VARIABLE,2.06UH	909400050	94668	909400050	1	
L2	INDUCTOR,VARIABLE,1.22UH,	909400048	94668	909400048	1	
L3	INDUCTOR,VARIABLE,2.06UH	909400050	94668	909400050	1	
L4	INDUCTOR,VARIABLE,0.89UH,	909400049	94668	909400049	1	
L5	INDUCTOR,VARIABLE	A01985200	94668	A01985200	1	
L6	INDUCTOR,VARIABLE	A01985200	94668	A01985200	1	
L7	INDUCTOR,VARIABLE	A01985200	94668	A01985200	1	
	SELECTIVITY FILTER	A02384800	94668	A02384800		
	SELECTIVITY FILTER SUBASSEMBLY	A02384600	94668	A02384600	1	
	SELECTIVITY FILTER SUBASSEMBLY	A02384700	94668	A02384700	1	
	COVER,FILTER	B02383900	94668	B02383900	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	SELECTIVITY FILTER SUBASSEMBLY	A02384600	94668	A02384600		
	SHIELD,FILTER	B02383800	94668	B02383800	1	
	IF BUFFERS	B02384300	94668	B02384300	REF	
	MARROW BAND EMITTER FOLLOWER	B02384400	94668	B02384400	REF	
	FILTER ASSEMBLY	C02383600	94668	C02383600	1	
	CAPACITOR,FXD,CERAMIC,1500 PF,200V,FEEDTHRU	902640152	72982	1201-052	4	
	FILTER,CRYSTAL,2.215 MHZ 250 CPS BANDPASS	910100004	94668	910100004	1	
	CONNECTOR,SOLDER RECEPTACLE,MINIATURE	914600099	00779	329852	2	
	SELECTIVITY FILTER SUBASSEMBLY	A02384700	94668	A02384700		
	WIDEBAND EMITTER FOLLOWERS	B02384500	94668	B02384500	REF	
	FILTER ASSEMBLY	C02383700	94668	C02383700	1	
	CAPACITOR,FXD,CERAMIC,1500 PF,200V,FEEDTHRU	902640152	72982	1201-052	2	
	RESISTOR,FXD,COMPOSITION,5600HMS,1/4W, PORM 5 PCT	906900561	82142	906900561	1	
	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
	FILTER,CRYSTAL,3.1 KHZ	910100017	94668	910100017	1	
	CONNECTOR,SOLDER RECEPTACLE,MINIATURE	914600099	00779	329852	1	
	INSULATOR,STANDOFF	915100010	71279	3650-1	2	
	PANEL,FRONT	C01989200	94668	C01989200		
	RESISTOR,FXD,COMPOSITION,330HMS,1/4W, PORM 5 PCT	906900330	82142	906900330	1	
S2	SWITCH,ROTARY	911200103	94668	911200103	1	
S3	SWITCH,ROTARY,2 POSITION,1 POLE,1 SECTION, NON-SHORTING	911200088	94668	911200088	1	
S4A	SWITCH,ROTARY,3 POSITION,1 POLE,1 SECTION, NON-SHORTING	911200102	94668	911200102	1	
	ADJUSTING PLATE ASSEMBLY	C01989300	94668	C01989300		
	CAPACITOR ADJUSTING PLATE	B01881300	94668	B01881300	1	
	INSULATING RING	B01881600	94668	B01881600	6	
	CAPACITOR ADJUSTING PLATE	B01894300	94668	B01894300	1	
	CAPACITOR ADJUSTING PLATE	B01906400	94668	B01906400	2	
	CONTACT PLATE	B01906800	94668	B01906800	13	
	CAPACITOR ADJUSTING PLATE	B01906900	94668	B01906900	2	
	CAPACITOR ADJUSTING PLATE	B01920200	94668	B01920200	1	
	INSULATING RING	B01984000	94668	B01984000	1	
	CAPACITOR,VARIABLE,GLASS PISTON,0.6-14 PF	903000120	73899	VC11G	3	
	CAPACITOR,VARIABLE GLASS PISTON,1-60 PF	903000600	73899	VCJ-1553	1	
	RESISTOR, FXD, COMPOSITION, 22 OHMS, 1/4W, PORM 5 PCT	906900220	01121	CB	2	
	NUT,ADJUSTING	917300279	94668	917300279	9	
	NUT,LOCK	917300280	94668	917300280	9	
	PLATE,ATTENUATOR	920400010	94668	920400010	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	PLATE,CAPACITOR ASSEMBLY	C01989400	94668	C01989400		
	PLATE,CAPACITOR	B01824400	94668	B01824400	2	
	PLATE,CAPACITOR	B01863100	94668	B01863100	1	
	PLATE,CAPACITOR	B01893900	94668	B01893900	1	
	PLATE,CAPACITOR	B01907000	94668	B01907000	1	
	PLATE,CAPACITOR	B01907300	94668	B01907300	1	
	PLATE,CAPACITOR	B01988000	94668	B01988000	2	
	CAPACITOR,FXD,MICA,100 PF,PORM 5 PCT, 250V,BUTTON	901800101	72982	2930-004	9	
	CAPACITOR,FXD,MICA,68 PF,PORM 5 PCT,250 V, BUTTON	901800680	72982	901800680	2	
	PRINTED CIRCUIT BOARD	904500073	94668	904500073	1	
	PLATE,REAR	C01989700	94668	C01989700		
	CABLE ASSEMBLY	B02084402	94668	B02084402	1	
	PREAMPLIFIER SUBASSEMBLY	B02163000	94668	B02163000	REF	
	CABLE CLAMP	B02339700	94668	B02339700	1	
	INSULATOR,FEED THROUGH TERMINAL	915100093	15849	1431	1	
C32	CAPACITOR,FXD,CERAMIC,1500 PF,200V,FEEDTHRU	902640152	72982	1201-052	1	
C34	CAPACITOR,FXD,CERAMIC,1500 PF,200V,FEEDTHRU	902640152	72982	1201-052	1	
L1	INDUCTOR, FXD, MOLDED, 82UH	909000124	99800	1537-72	1	
S2C	SWITCH,ROTARY	911200094	94668	911200094	1	
	GAIN REFERENCE SUBASSEMBLY	B01999500	94668	B01999500		
	PRINTED CIRCUIT BOARD	904500103	94668	904500103	1	
	CLIP,CRYSTAL HOLDING,STEEL	921100004	91506	8000-HP3	1	
C1	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C2	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C3	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C4	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C5	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
C6	CAPACITOR,FXD,MICA,1500PF,PORM 5 PCT, 500VDCW	901900152	72136	DM19F-152J	1	
C7	CAPACITOR,FXD,MICA,330 PF,PORM 5 PCT, 500V	901900331	72136	DM15F-331J	1	
C8	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C9	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
CR1	DIODE,SILICON	910500010	49956	1N3604	1	
L1	INDUCTOR,FXD,MOLDED,10UH,PORM 10 PCT,1/4W	909000125	76493	9310-36	1	
L2	INDUCTOR,FXD,MOLDED,24UH	909000121	94668	909000121	1	
L3	INDUCTOR,FXD,MOLDED,24UH	909000121	94668	909000121	1	
L4	INDUCTOR, VARIABLE, 90 UH NOM	A01897400	94668	A01897400	1	
Q1	TRANSISTOR,SILICON,NPN	910300026	04713	2N2368	1	
Q2	TRANSISTOR	210300017	15124	2N2360	1	
Q3	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R1	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R2	RESISTOR,FXD,COMPOSITION,15000HMS,PORM 5 PCT, 1/4 W	906900152	01121	CB1525	1	
R3	RESISTOR,FXD,COMPOSITION, 6800HMS,1/4W, PORM 5 PCT	906900681	82142	906900681	1	
R4	RESISTOR,FXD,COMPOSITION,33000HMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	
R5	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R6	RESISTOR,FXD,COMPOSITION,5600HMS,1/4W, PORM 5 PCT	906900561	82142	906900561	1	
R7	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R8	RESISTOR,FXD,COMPOSITION,39000HMS,1/4W, PORM 5 PCT	906900392	82142	906900392	1	
R9	RESISTOR,FXD,COMPOSITION,150000HMS,PORM 5 PCT,1/4 W	906900153	01121	CB1535	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET-TRANSISTOR,4 PIN	914200037	81073	22-16-4	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XY1	SOCKET,	914200007	76487	33302	1	
Y1	CRYSTAL,1.000 MHZ	912200026	94668	912200026	1	
	MAIN TUNING OSCILLATOR	B01999600	94668	B01999600		
	PRINTED CIRCUIT BOARD	904500102	94668	904500102	1	
	CLAMP,TRANSISTOR	916900019	94668	916900019	1	
C1	CAPACITOR,VERTICAL MOUNTING,PLASTIC ENCASED 1.0 UF,25V N.P.	903300105	94668	903300105	1	
C2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C3	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C4	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C5	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C6	CAPACITOR,FXD,CERAMIC,12 PF,PORM 2 PCT	901420120	00656	51-1	1	
C7	CAPACITOR,FXD,MICA,30 PF,PORM 2 PCT,500 V	901900300	72136	DM15-300G	1	
C8	CAPACITOR,VARIABLE,GLASS PISTON,0.6-14 PF	903000120	73899	VC11G	1	
C9	CAPACITOR,FXD,CERAMIC,68 PF,PORM 2 PCT,NPO	901420680	72982	8020000G0680G	1	
C10	CAPACITOR,FXD,MICA,100 PF,PORM 5 PCT, 500V	901900101	72136	DM15F-101J	1	
C11	CAPACITOR,FXD,MICA,3PF,PLUS 0.5PF,500V	901900030	72136	DM15-030	1	
C12	CAPACITOR,FXD,MICA,3PF,PLUS 0.5PF,500V	901900030	72136	DM15-030	1	
C13	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C14	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
CR1	DIODE,VARI-CAP V10	913600010	01281	V-10	1	
L1	INDUCTOR,VARIABLE,GLASS,0.56UH	909400052	73899	LV5P056	1	
L2	INDUCTOR,FXD,MOLDED,24UH	909000121	94668	909000121	1	
Q1	TRANSISTOR,SILICON,NPN	910300024	07263	2N706B	1	
Q2	TRANSISTOR,GERMANIUM PNP	910300017	56289	2N2360	1	
R1	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
R2	RESISTOR, FXD, COMPOSITION, 39 K OHMS, 1/4W, PORM 5 PCT	906900393	01121	CB	1	
R3	RESISTOR, FXD, COMPOSITION, 5600HMS, 1/4W, PORM 5 PCT	906900562	01121	CB	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R4	RESISTOR,FXD,COMPOSITION, 6800HMS,1/4W, PORM 5 PCT	906900681	82142	906900681	1	
R5	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R6	RESISTOR,FXD,COMPOSITION,33000HMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	
R7	RESISTOR,FXD,COMPOSITION,22KOHMS,1/4W, PORM 5 PCT	906900223	82142	906900223	1	
R8	RESISTOR,FXD,COMPOSITION,3300HMS,1/4W, PORM 5 PCT	906900331	82142	906900331	1	
R9	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R10	RESISTOR,FXD,COMPOSITION,3300HMS,1/4W, PORM 5 PCT	906900331	82142	906900331	1	
R11	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
R12	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET-TRANSISTOR,4 PIN	914200037	81073	22-16-4	1	
	MAIN TUNING SWITCH ASSEMBLY	B02001500	94668	B02001500		
	PRINTED CIRCUIT BOARD	904500099	94668	904500099	1	
	SWITCH,ROTARY,2 POSITION,2 POLE,2 SECTION, NON-SHORTING	911200099	94668	911200099	1	
J14	CONNECTOR,RECEPTACLE,P.C. BOARD	914600100	00779	329852	1	
J15	CONNECTOR,RECEPTACLE,P.C. BOARD	914600100	00779	329852	1	
J16	CONNECTOR,RECEPTACLE,P.C. BOARD	914600100	00779	329852	1	
R1	RESISTOR,FXD,COMPOSITION,51000HMS,1/4W PORM 5 PCT	906900512	01121	CB	1	
R2	RESISTOR,VARIABLE,10KOHMS,1/4W,PORM 10 PCT, 25 TURNS	907900172	01121	RP103V	1	
	FIRST MIXER	B02050200	94668	B02050200		
	PRINTED CIRCUIT BOARD	904500083	94668	904500083	1	
	RESISTOR,FXD,COMPOSITION,220OHMS,PORM 5 PCT,1/4 W	906900221	01121	CB2215	1	
C1	CAPACITOR,VERTICAL MOUNTING,PLASTIC ENCASED 1.0 UF,25V N.P.	903300105	94668	903300105	1	
C2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C3	CAPACITOR,VERTICAL MOUNTING,PLASTIC ENCASED 1.0 UF,25V N.P.	903300105	94668	903300105	1	
C4	CAPACITOR,VERTICAL MOUNTING,PLASTIC ENCASED 1.0 UF,25V N.P.	903300105	94668	903300105	1	
Q1	TRANSISTOR,GERMANIUM PNP	910300019	96214	2N2997	1	
R1	RESISTOR,FXD,COMPOSITION, 1500HMS,1/4W, PORM 5 PCT	906900151	82142	906900151	1	
R2	RESISTOR,FXD,COMPOSITION, 47K OHMS, 1/4W, PORM 5 PCT	906900473	01121	CB	1	
R3	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R4	RESISTOR,FXD,COMPOSITION,100HMS,1/4W, PORM 5 PCT	906900100	01121	CB-4R7J	1	
R5	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	

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R6	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
XQ1	SOCKET-TRANSISTOR,4 PIN	914200037	81073	22-16-4	1	
	FIRST MODULATOR	B02050300	94668	B02050300		
	CABLE ASSEMBLY	B01987601	94668	B01987601	1	
	PRINTED CIRCUIT BOARD	904500074	94668	904500074	1	
C1	CAPACITOR,FXD,MICA,5 PF,PORM 10 PCT,500 V	901900050	72136	DM15-050K	1	
C2	CAPACITOR,VARIABLE,GLASS PISTON,0.8-8 PF PRINTED CIRCUIT BOARD MOUNTING	903000885	73899	VC9GWY	1	
C3	CAPACITOR,FXD,MICA,5 PF,PORM 10 PCT,500 V	901900050	72136	DM15-050K	1	
C4	CAPACITOR,VARIABLE,GLASS PISTON,0.8-8 PF PRINTED CIRCUIT BOARD MOUNTING	903000885	73899	VC9GWY	1	
CR1	DIODE,GERMANIUM	910500003	31550	2N995	1	
CR2	DIODE,GERMANIUM	910500003	31550	2N995	1	
R1	RESISTOR,FXD,FILM,150 OHMS,PORM 1 PCT,1/8W, METAL FILM	907300002	19701	MF1-8-2740F	1	
R2	RESISTOR,FXD,FILM,150 OHMS,PORM 1 PCT,1/8W, METAL FILM	907300002	19701	MF1-8-2740F	1	
R3	RESISTOR,VARIABLE,500 OHMS,1/4W	907900102	01121	RS501M	1	
R4	RESISTOR, FXD, FILM, 274 OHMS, 1/8W, PORM 1 PCT, METAL FILM	907300003	19701	RN60D2740F	1	
R5	RESISTOR, FXD, FILM, 274 OHMS, 1/8W, PORM 1 PCT, METAL FILM	907300003	19701	RN60D2740F	1	
R6	RESISTOR, FXD, FILM, 56.2KOHMS, 1/8W, PORM 1 PCT, METAL FILM	907300001	19701	RN60D5622F	1	
R7	RESISTOR, FXD, FILM, 56.2KOHMS, 1/8W, PORM 1 PCT, METAL FILM	907300001	19701	RN60D5622F	1	
T1	TRANSFORMER	909900014	01961	PE5864	1	
	SECOND I.F.	B02050500	94668	B02050500		
	CABLE ASSEMBLY	B02084400	94668	B02084400	1	
	PRINTED CIRCUIT BOARD	904500078	94668	904500078	1	
	THERMISTOR	913600002	94668	913600002	1	
	CLAMP,TRANSISTOR	916900019	94668	916900019	1	
C1	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C2	CAPACITOR,VERTICAL MOUNTING,PLASTIC ENCASED 1.0 UF,25V N.P.	903300105	94668	903300105	1	
C3	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C4	CAPACITOR,FXD,MICA,56 PF,PORM 5PCT, 500 V	901900560	72136	DM15E-560J	1	
L1	INDUCTOR, VARIABLE, 90 UH NOM	A01897400	94668	A01897400	1	
Q1	TRANSISTOR,GERMANIUM PNP	910300017	56289	2N2360	1	
R1	RESISTOR,FXD,COMPOSITION,8200 OHMS,1/4W, PORM 5 PCT	906900822	82142	906900822	1	
R2	RESISTOR,FXD,COMPOSITION,120KOHMS,1/4W, PORM 5 PCT	906900124	01121	CB	1	
R3	RESISTOR,FXD,COMPOSITION,470HMS,PORM 5 PCT,1/4W	906900470	01121	CB4705	1	
R4	RESISTOR,FXD,COMPOSITION,4700HMS,1/4W, PORM 5 PCT	906900471	82142	906900471	1	
R5	RESISTOR,FXD,COMPOSITION,4700HMS,1/4W, PORM 5 PCT	906900471	82142	906900471	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R6	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R7	RESISTOR,FXD,COMPOSITION,5600HMS,1/4W, PORM 5 PCT	906900561	82142	906900561	1	
XQ1	SOCKET-TRANSISTOR,4 PIN	914200037	81073	22-16-4	1	
	POWER SUPPLY	B02051200	94668	B02051200		
	PRINTED CIRCUIT BOARD	904500185	94668	904500185	1	
	CLAMP,TRANSISTOR	916900019	94668	916900019	1	
	HEAT SINK	921300001	74370	3AL-672	1	
C1	CAPACITOR,FXD,ELECTROLYTIC,500 MFD,50 V	902200507	76055	TS19021	1	
C2	CAPACITOR,NON-POLAR,ELECTROLYTIC,25UF,PORM 20 PCT,50V,VERTICAL MOUNTING	903300256	76055	MTV250M50E/ANP	1	
C3	CAPACITOR,FXD,ELECTROLYTIC,500 MFD,50 V	902200507	76055	TS19021	1	
C4	CAPACITOR,FXD,ELECTROLYTIC,500 MFD,50 V	902200507	76055	TS19021	1	
C5	CAPACITOR, FXD, MYLAR, 0.05MFD, PORM 10PCT, PAPER MYLAR	901100503	72136	1DP-2-503	1	
C6	CAPACITOR,FXD,CERAMIC,0.02MFD,1000V,	901410203	12294	841-ED25V-203P	1	
C7	CAPACITOR,FXD,CERAMIC,0.02MFD,1000V,	901410203	12294	841-ED25V-203P	1	
C8	CAPACITOR,NON-POLAR,50 UF,MINUS 10 PCT,PLUS 100 PCT,25V,VERTICAL MOUNTING	903300506	76055	MTV500N025E0PN	1	
CR1	DIODE,ZENER,SILICON	910500032	81483	1N707A	1	
CR2	RECTIFIER,SILICON,600V,750MA	910800008	94668	910800008	1	
CR3	RECTIFIER,SILICON,600V,750MA	910800008	94668	910800008	1	
CR4	RECTIFIER,SILICON,600V,750MA	910800008	94668	910800008	1	
CR5	RECTIFIER,SILICON,600V,750MA	910800008	94668	910800008	1	
CR6	RECTIFIER,SILICON,600V,750MA	910800008	94668	910800008	1	
Q1	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
Q2	TRANSISTOR,GERMANIUM PNP	910300015	01002	2N508	1	
Q3	TRANSISTOR,GERMANIUM PNP	910300015	01002	2N508	1	
Q3	CLAMP,TRANSISTOR	916900019	94668	916900019	1	
Q4	TRANSISTOR,POWER,GERMANIUM PNP	910300021	04713	2N375	1	
R1	RESISTOR,FXD,COMPOSITION,3K OHMS,PORM 5 PCT 1/4W	906900302	01121	AB-3001J	1	
R2	RESISTOR, VARIABLE,10000HMS, PORM 10 PCT, CERMET, PC BOARD MTG	907900290	73138	A9PR1K	1	
R3	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R4	RESISTOR, FXD, COMPOSITION, 56KOHMS,1/4W, PORM 5 PCT	906900563	01121	CB	1	
R5	RESISTOR, FXD, COMPOSITION, 220 KOHMS, 1/4 W, PORM 5 PCT	906900224	01121	CB	1	
R6	RESISTOR,FXD,COMPOSITION,33000HMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	
R7	RESISTOR,FXD,COMPOSITION,33000HMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	
R8	RESISTOR, FXD, COMPOSITION, 6800 OHMS, 1/4W, PORM 5 PCT	906900682	01121	CB	1	
R9	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R11	RESISTOR,FXD,COMPOSITION,10 OHMS,PORM 5 PLT 2 W	905800100	01121	HB-100J	1	
R12	RESISTOR,FXD,COMPOSITION,82 OHMS,PORM 5 PCT 2W	905800820	01121	AB-820J	1	
T1	TRANSFORMER,POWER,PRIMARY 115/23V	910000090	94668	910000090	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	PREAMPLIFIER SUBASSEMBLY	B02163000	94668	B02163000		
	PRINTED CIRCUIT BOARD	904500129	94668	904500129	1	
C1	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C2	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C3	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C4	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C5	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
C6	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C7	CAPACITOR,FXD,MICA,100 PF,PORM 5 PCT, 500V	901900101	72136	DM15F-101J	1	
C8	CAPACITOR,VARIABLE,GLASS PISTON,1-60 PF, PRINTED CIRCUIT BOARD MOUNTING	903010600	73899	MC626Y	1	
Q1	TRANSISTOR,SILICON NPN	910300038	07263	2N2483	1	
Q2	TRANSISTOR,SILICON NPN	910300038	07263	2N2483	1	
Q3	TRANSISTOR,SILICON,NPN	910300024	07263	2N706B	1	
R1	RESISTOR,FXD,COMPOSITION,22000K OHMS,1/4W, PORM 5 PCT	906900226	01121	CB	1	
R2	RESISTOR,FXD,COMPOSITION, 47K OHMS, 1/4W, PORM 5 PCT	906900473	01121	CB	1	
R3	RESISTOR,FXD,COMPOSITION,2200 K OHMS,PORM 5 PCT,1/4W	906900225	94668	906900225	1	
R4	RESISTOR,FXD,COMPOSITION,15000HMS,PORM 5 PCT, 1/4 W	906900152	01121	CB1525	1	
R5	RESISTOR,FXD,COMPOSITION, 1500HMS,1/4W, PORM 5 PCT	906900151	82142	906900151	1	
R6	RESISTOR,FXD,COMPOSITION,470HMS,PORM 5 PCT,1/4W	906900470	01121	CB4705	1	
R7	RESISTOR,FXD,COMPOSITION,470HMS,PORM 5 PCT,1/4W	906900470	01121	CB4705	1	
R8	RESISTOR,FXD,COMPOSITION, 6800HMS,1/4W, PORM 5 PCT	906900681	82142	906900681	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	IF AMPLIFIER AND INCREMENTAL MIXER ASSEMBLY	B02326800	94668	B02326800		
	SHIELD	B02327400	94668	B02327400	1	
	COAXIAL CABLE SUBASSEMBLY	B02327502	94668	B02327502	1	
	INCREMENTAL MIXER	B02327700	94668	B02327700	REF	
	IF OUTPUT AMPLIFIER	B02327900	94668	B02327900	REF	
	CAPACITOR,FXD,MICA,3PF,PLUS 0.5PF,500V	901900030	72136	DM15-030	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	SECOND MODULATOR	B02327100	94668	B02327100		
	CABLE ASSEMBLY	B01987600	94668	B01987600	1	
	CABLE ASSEMBLY	B02327501	94668	B02327501	1	
	PRINTED CIRCUIT BOARD	904500175	94668	904500175	1	
	CONNECTOR,SOLDER RECEPTACLE,MINIATURE	914600099	00779	329852	1	
C1	CAPACITOR,FXD,MICA,5 PF,PORM 10 PCT,500 V	901900050	72136	DM15-050K	1	
C2	CAPACITOR,VARIABLE,GLASS PISTON,0.8-8 PF PRINTED CIRCUIT BOARD MOUNTING	903000885	73899	VC9GWY	1	
C3	CAPACITOR,FXD,MICA,5 PF,PORM 10 PCT,500 V	901900050	72136	DM15-050K	1	
C4	CAPACITOR,VARIABLE,GLASS PISTON,0.8-8 PF PRINTED CIRCUIT BOARD MOUNTING	903000885	73899	VC9GWY	1	
CR1	DIODE,GERMANIUM	910500003	31550	2N995	1	
CR2	DIODE,GERMANIUM	910500003	31550	2N995	1	
R1	RESISTOR,FXD,FILM,150 OHMS,PORM 1 PCT,1/8W, METAL FILM	907300002	19701	MF1-8-2740F	1	
R2	RESISTOR,FXD,FILM,150 OHMS,PORM 1 PCT,1/8W, METAL FILM	907300002	19701	MF1-8-2740F	1	
R3	RESISTOR,VARIABLE,500 OHMS,1/4W	907900102	01121	RS501M	1	
R4	RESISTOR, FXD, FILM, 274 OHMS, 1/8W, PORM 1 PCT, METAL FILM	907300003	19701	RN60D2740F	1	
R5	RESISTOR, FXD, FILM, 274 OHMS, 1/8W, PORM 1 PCT, METAL FILM	907300003	19701	RN60D2740F	1	
R6	RESISTOR, FXD, FILM, 56.2KOHMS, 1/8W, PORM 1 PCT, METAL FILM	907300001	19701	RN60D5622F	1	
R7	RESISTOR, FXD, FILM, 56.2KOHMS, 1/8W, PORM 1 PCT, METAL FILM	907300001	19701	RN60D5622F	1	
R8	RESISTOR,FXD,COMPOSITION,2200HMS,PORM 5 PCT,1/4 W	906900221	01121	CB2215	1	
R9	RESISTOR, FXD, COMPOSITION, 56 OHMS, 1/4W, PORM 5 PCT	906900560	01121	CB	1	
T1	TRANSFORMER	909900014	01961	PE5864	1	
	INCREMENTAL MIXER	B02327700	94668	B02327700		
	PRINTED CIRCUIT BOARD	904500173	94668	904500173	1	
	INSULATOR,STANDOFF,TRANSISTOR	915100049	88822	1932XM	3	
C1	CAPACITOR,VERTICAL MOUNTING,PLASTIC ENCASED 1.0 UF,25V N.P.	903300105	94668	903300105	1	
C2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C3	CAPACITOR,FXD,MICA,47PF,PORM 5 PCT, 500V	901900470	72136	DM15E-470J	1	
C4	CAPACITOR,FXD,MICA,680PF,PORM 5 PCT,300VDCW	901900681	72136	DM15F-681J	1	
L1	INDUCTOR,68UH,PORM 5 PCT,	909000131	72259	WEE68	1	
L2	INDUCTOR, VARIABLE, 90 UH NOM	A01897400	94668	A01897400	1	
Q1	TRANSISTOR,SILICON PNP	910300042	04713	2N3563	1	
Q2	TRANSISTOR,SILICON PNP	910300042	04713	2N3563	1	
Q3	TRANSISTOR,GERMANIUM PNP	910300019	96214	2N2997	1	
R1	RESISTOR,FXD,COMPOSITION,270OHMS,1/4W, PORM 5 PCT	906900271	82142	906900271	1	
R2	RESISTOR,FXD,COMPOSITION,150000HMS,PORM 5 PCT,1/4 W	906900153	01121	CB1535	1	
R3	RESISTOR, FXD, COMPOSITION, 6800 OHMS, 1/4W, PORM 5 PCT	906900682	01121	CB	1	
R4	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R5	RESISTOR,FXD,COMPOSITION,150000HMS,PORM 5 PCT,1/4 W	906900153	01121	CB1535	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R6	RESISTOR,FXD,COMPOSITION,27000HMS,PORM 5 PCT,1/4 W	906900272	01121	CB2725	1	
	IF OUTPUT AMPLIFIER	B02327900	94668	B02327900		
	PRINTED CIRCUIT BOARD	904500174	94668	904500174	1	
	RESISTOR,FXD,COMPOSITION,15000HMS,PORM 5 PCT, 1/4 W	906900152	01121	CB1525	1	
	RESISTOR,VARIABLE,CERMET,500 OHMS,PORM 10 PCT,1W	907900223	71450	M175PCT	1	
	INSULATOR,STANDOFF,TRANSISTOR	915100049	88822	1932XM	3	
C1	CAPACITOR,FXD,CERAMIC 0.001 MF,500V	901400102	83100	901400102	1	
C2	CAPACITOR,FXD,CERAMIC 0.001 MF,500V	901400102	83100	901400102	1	
C3	CAPACITOR,FXD,CERAMIC 0.001 MF,500V	901400102	83100	901400102	1	
C4	CAPACITOR,FXD,CERAMIC 0.001 MF,500V	901400102	83100	901400102	1	
C5	CAPACITOR,FXD,CERAMIC 0.001 MF,500V	901400102	83100	901400102	1	
CR1	DIODE,SILICON	910500031	09231	1N456	1	
Q1	TRANSISTOR,SILICON PNP	910300042	04713	2N3563	1	
Q2	TRANSISTOR,SILICON PNP	910300042	04713	2N3563	1	
Q3	TRANSISTOR,SILICON PNP	910300042	04713	2N3563	1	
R1	RESISTOR,FXD,COMPOSITION,22KOHMS,1/4W, PORM 5 PCT	906900223	82142	906900223	1	
R2	RESISTOR,FXD,COMPOSITION,22KOHMS,1/4W, PORM 5 PCT	906900223	82142	906900223	1	
R3	RESISTOR,FXD,COMPOSITION,150000HMS,PORM 5 PCT,1/4 W	906900153	01121	CB1535	1	
R4	RESISTOR, FXD, COMPOSITION, 560000HMS, 1/4W, PORM 5 PCT	906900562	01121	CB	1	
R6	RESISTOR,FXD,COMPOSITION,100HMS,1/4W, PORM 5 PCT	906900100	01121	CB-4R7J	1	
R7	RESISTOR,FXD,COMPOSITION,12000HMS,PORM 5 PCT,1/4 W	906900122	01121	CB1225	1	
R8	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R10	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
	IF BUFFERS	B02384300	94668	B02384300		
	PRINTED CIRCUIT BOARD	904500199	94668	904500199	1	
C1	CAPACITOR,FXD,MICA,220PF,500V,PORM 5 PCT	901900221	72136	DM15F221J	1	
C2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C3	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C4	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C5	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C6	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C7	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C8	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C9	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
C10	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C11	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
K1	RELAY,PRINTED CIRCUIT BOARD MOUNTING	912600030	23095	101122	1	
L1	INDUCTOR,FXD,MOLDED,24UH	909000121	94668	909000121	1	
Q1	TRANSISTOR,SILICON PNP	910300047	07263	2N3640	1	
Q2	TRANSISTOR,SILICON PNP	910300047	07263	2N3640	1	
R1	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R2	RESISTOR,FXD,COMPOSITION,22KOHMS,1/4W, PORM 5 PCT	906900223	82142	906900223	1	
R3	RESISTOR,FXD,COMPOSITION,1800HMS,1/4W, PORM 5 PCT	906900181	01121	CB	1	
R4	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
R5	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R6	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R7	RESISTOR,FXD,COMPOSITION,3K OHMS,PORM 5 PCT 1/4W	906900302	01121	AB-3001J	1	
R8	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R9	RESISTOR,FXD,COMPOSITION,22KOHMS,1/4W, PORM 5 PCT	906900223	82142	906900223	1	
R11	RESISTOR,VARIABLE,150 OHMS,PORM 20 PCT,1/4W 25 TURNS	907900171	01121	RP	1	
R12	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R13	RESISTOR,FXD,COMPOSITION,820 OHMS,1/4W, PORM 5 PCT	906900821	82142	906900821	1	
R14	RESISTOR,FXD,COMPOSITION,3K OHMS,PORM 5 PCT 1/4W	906900302	01121	AB-3001J	1	
R15	RESISTOR,FXD,COMPOSITION,2200HMS,PORM 5 PCT,1/4 W	906900221	01121	CB2215	1	
R16	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	MARROW BAND EMITTER FOLLOWER	B02384400	94668	B02384400		
	PRINTED CIRCUIT BOARD	904500198	94668	904500198	1	
C1	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C3	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C4	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
E2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
K1	RELAY,PRINTED CIRCUIT BOARD MOUNTING	912600030	23095	101122	1	
Q1	TRANSISTOR,SILICON PNP	910300047	07263	2N3640	1	
R1	RESISTOR,FXD,COMPOSITION,39000HMS,1/4W, PORM 5 PCT	906900392	82142	906900392	1	
R2	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
R3	RESISTOR,FXD,COMPOSITION,8200 OHMS,1/4W, PORM 5 PCT	906900822	82142	906900822	1	
R4	RESISTOR, FXD, COMPOSITION, 39 K OHMS, 1/4W, PORM 5 PCT	906900393	01121	CB	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R5	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R6	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	WIDEBAND EMITTER FOLLOWERS	B02384500	94668	B02384500		
	PRINTED CIRCUIT BOARD	904500197	94668	904500197	1	
	RELAY,PRINTED CIRCUIT BOARD MOUNTING	912600030	23095	101122	1	
C1	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C3	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C4	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C5	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
Q1	TRANSISTOR,SILICON PNP	910300047	07263	2N3640	1	
Q2	TRANSISTOR,SILICON PNP	910300047	07263	2N3640	1	
R1	RESISTOR, FXD, COMPOSITION, 18000HMS, 1/4W, PORM 5 PCT	906900182	01121	CB	1	
R2	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R3	RESISTOR,FXD,COMPOSITION,8200 OHMS,1/4W, PORM 5 PCT	906900822	82142	906900822	1	
R4	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R5	RESISTOR, FXD, COMPOSITION, 39 K OHMS, 1/4W, PORM 5 PCT	906900393	01121	CB	1	
R6	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R7	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R8	RESISTOR, FXD, COMPOSITION, 39 K OHMS, 1/4W, PORM 5 PCT	906900393	01121	CB	1	
R9	RESISTOR,FXD,COMPOSITION,33000HMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	OUTPUT AMPLIFIER	C02051000	94668	C02051000		
	CABLE ASSEMBLY	B01920500	94668	B01920500	1	
	CABLE ASSEMBLY	B01920501	94668	B01920501	1	
	PRINTED CIRCUIT BOARD	B01987900	94668	B01987900	1	
	CABLE ASSEMBLY	B02052004	94668	B02052004	1	
	CABLE ASSEMBLY	B02084401	94668	B02084401	1	
	CAPACITOR,FXD,CERAMIC,1500 PF,200V,FEEDTHRU	902640152	72982	1201-G52	1	
	RESISTOR,VARIABLE,2,5K OHMS,PORM 10 PCT	907900152	71450	35774	1	
	INSULATOR,FEED-THRU	915100029	94668	915100029	3	
	CLAMP,TRANSISTOR	916900019	94668	916900019	5	
C1	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
C3	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C4	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C5	CAPACITOR,FXD,CERAMIC,47 PF,PORM 2PCT	901420470	00656	51-1	1	
C6	CAPACITOR,FXD,MICA,1200 PF,PORM 5 PCT, 500V,DIPPED	901900122	72136	DM19-122J	1	
C7	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C8	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C9	CAPACITOR,FXD,CERAMIC,82 PF,PORM 2 PCT	901400820	71590	TCN82	1	
C10	CAPACITOR,FXD,MICA,100 PF,PORM 5 PCT, 500V	901900101	72136	DM15F-101J	1	
C12	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C14	CAPACITOR,FXD,MICA,220PF,500V,PORM 5 PCT	901900221	72136	DM15F221J	1	
C15	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C16	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C17	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C18	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C19					1	
C20	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C21	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C22	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C23	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C24	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C25	CAPACITOR,FXD,CERAMIC, 0.1MFD,100V. PORM 10 PCT, RADIAL LEADS, MIL-C-11015/19	901330104	81349	CK06BX104K	1	
C26	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
CR1	DIODE,HOT-CARRIER	910500069	28480	5082-2900	1	
CR2	DIODE,HOT-CARRIER	910500069	28480	5082-2900	1	
K1	RELAY,SINGLE POLE DOUBLE THROW,PRINTED CIRCUIT BOARD MOUNTING	912600028	94668	912600028	1	
L1	INDUCTOR, VARIABLE, 90 UH NOM	A01897400	94668	A01897400	1	
L2	INDUCTOR, VARIABLE, 90 UH NOM	A01897400	94668	A01897400	1	
L3	INDUCTOR,FXD,MOLDED,24UH	909000121	94668	909000121	1	
L4	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
L5	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
L6	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
L7	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
L8	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
Q1	TRANSISTOR,GERMANIUM PNP	910300017	56289	2N2360	1	
Q2	TRANSISTOR,GERMANIUM PNP	910300017	56289	2N2360	1	
Q3	TRANSISTOR,GERMANIUM PNP	910300020	56289	910300020	1	
Q4	TRANSISTOR,GERMANIUM PNP	910300020	56289	910300020	1	
Q5	TRANSISTOR,GERMANIUM PNP	910300020	56289	910300020	1	
R1	RESISTOR,FXD,COMPOSITION,4700HMS,1/4W, PORM 5 PCT	906900471	82142	906900471	1	
R2	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R3	RESISTOR,FXD,COMPOSITION, 6800HMS,1/4W, PORM 5 PCT	906900681	82142	906900681	1	
R4	RESISTOR,VARIABLE,500 OHMS,1/4W	907900102	01121	RS501M	1	
R5	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R6	RESISTOR, FXD, COMPOSITION, 56KOHMS,1/4W, PORM 5 PCT	906900563	01121	CB	1	
R7	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R8	RESISTOR, FXD, COMPOSITION, 6800 OHMS, 1/4W, PORM 5 PCT	906900682	01121	CB	1	
R9	RESISTOR,FXD,COMPOSITION,470HMS,PORM 5 PCT,1/4W	906900470	01121	CB4705	1	
R10	RESISTOR,FXD,COMPOSITION,27KOHMS,1/4W, PORM 5 PCT	906900273	82142	906900273	1	
R11	RESISTOR, FXD, COMPOSITION, 56KOHMS,1/4W, PORM 5 PCT	906900563	01121	CB	1	
R12	RESISTOR, FXD, COMPOSITION, 6800 OHMS, 1/4W, PORM 5 PCT	906900682	01121	CB	1	
R13	RESISTOR,FXD,COMPOSITION,100HMS,1/4W, PORM 5 PCT	906900100	01121	CB-4R7J	1	
R14	RESISTOR,FXD,COMPOSITION, 47K OHMS, 1/4W, PORM 5 PCT	906900473	01121	CB	1	
R15	RESISTOR,FXD,COMPOSITION,27KOHMS,1/4W, PORM 5 PCT	906900273	82142	906900273	1	
R16	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R17	RESISTOR, FXD, COMPOSITION, 18K OHMS, 1/4W, PORM 5 PCT	906900183	01121	CB	1	
R18	RESISTOR, FXD, COMPOSITION, 56KOHMS,1/4W, PORM 5 PCT	906900563	01121	CB	1	
R19	RESISTOR,VARIABLE,2500 OHMS,PORM 20 PCT, LINEAR	907900180	71450	35464	1	
R20	RESISTOR,FXD,COMPOSITION,5600HMS,1/4W, PORM 5 PCT	906900561	82142	906900561	1	
R21	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R23	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R24	RESISTOR,FXD,COMPOSITION, 47K OHMS, 1/4W, PORM 5 PCT	906900473	01121	CB	1	
R25	RESISTOR,FXD,COMPOSITION,5600HMS,1/4W, PORM 5 PCT	906900561	82142	906900561	1	
R26	RESISTOR, FXD, COMPOSITION, 18000HMS, 1/4W, PORM 5 PCT	906900182	01121	CB	1	
R27	RESISTOR, FXD, COMPOSITION, 56000HMS, 1/4W, PORM 5 PCT	906900562	01121	CB	1	
R28	RESISTOR, FXD, COMPOSITION, 56000HMS, 1/4W, PORM 5 PCT	906900562	01121	CB	1	
R29	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R30	RESISTOR, FXD, COMPOSITION, 18000HMS, 1/4W, PORM 5 PCT	906900182	01121	CB	1	
R31	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R32	RESISTOR,FXD,COMPOSITION,1800HMS,1/4W, PORM 5 PCT	906900181	01121	CB	1	
R33	RESISTOR, FXD, COMPOSITION, 56000HMS, 1/4W, PORM 5 PCT	906900562	01121	CB	1	
XQ1	SOCKET-TRANSISTOR,4 PIN	914200037	81073	22-16-4	1	
XQ2	SOCKET-TRANSISTOR,4 PIN	914200037	81073	22-16-4	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ5	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	AUDIO SUBASSEMBLY	C02051100	94668	C02051100		
	CABLE ASSEMBLY	B02084400	94668	B02084400	1	
	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
	PRINTED CIRCUIT BOARD	904500069	94668	904500069	1	
					1	
	SWITCH,ROTARY,3 POSITION,2 POLE,1 SECTION, NON-SHORTING	911200058	72982	3612-10	1	
	SOCKET-TRANSISTOR,4 PIN	914200037	81073	22-16-4	1	
	JACK,PHONE,NORMALLY CLOSED CIRCUIT	914400014	82389	13E	1	
	CLAMP,TRANSISTOR	916900019	94668	916900019	9	
	CLIP,CRYSTAL HOLDING,STEEL	921100004	91506	8000-HP3	2	
C1	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C3	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
C4	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C5	CAPACITOR,FXD,MICA,47PF,PORM 5 PCT, 500V	901900470	72136	DM15E-470J	1	
C6	CAPACITOR,FXD,MICA,3000PF,PORM 5 PCT, 500VDCW	901900302	72136	DM19-302J	1	
C7	CAPACITOR,NON-POLAR,50 UF,MINUS 10 PCT,PLUS 100 PCT,25V,VERTICAL MOUNTING	903300506	76055	MTV500N025E0PN	1	
C8	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C9	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C10	CAPACITOR,NON-POLAR,50 UF,MINUS 10 PCT,PLUS 100 PCT,25V,VERTICAL MOUNTING	903300506	76055	MTV500N025E0PN	1	
C11	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
C12	CAPACITOR,NON-POLAR,50 UF,MINUS 10 PCT,PLUS 100 PCT,25V,VERTICAL MOUNTING	903300506	76055	MTV500N025E0PN	1	
C13	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
C14	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
C15	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C16	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C17	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C18	CAPACITOR,FXD,MICA,390PF,500V, PORM 5 PCT	901900391	72136	DM15F391J	1	
C19	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C20	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C21	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C22	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C23	CAPACITOR, FXD, MICA, 68PF, 500VDCW, PORM 2 PCT	901900680	72136	DM15-680G	1	
C24	CAPACITOR,FXD,MICA,390PF,500V, PORM 5 PCT	901900391	72136	DM15F391J	1	
C25	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C26	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
C27	CAPACITOR, FXD, MICA, 68PF, 500VDCW, PORM 2 PCT	901900680	72136	DM15-680G	1	
C28	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C29	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
L1	INDUCTOR, VARIABLE, 90 UH NOM	A01897400	94668	A01897400	1	
L2	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
L3	INDUCTOR, VARIABLE, 90 UH NOM	A01897400	94668	A01897400	1	
L4	INDUCTOR, VARIABLE, 90 UH NOM	A01897400	94668	A01897400	1	
L5	INDUCTOR,FXD,MOLDED,24UH	909000121	94668	909000121	1	
L6	INDUCTOR,FXD,MOLDED,24UH	909000121	94668	909000121	1	
Q1	TRANSISTOR,GERMANIUM PNP	910300017	56289	2N2360	1	
Q2	TRANSISTOR,GERMANIUM PNP	910300020	56289	910300020	1	
Q3	TRANSISTOR,GERMANIUM PNP	910300008	56289	2N1728	1	
Q4	TRANSISTOR,GERMANIUM PNP	910300008	56289	2N1728	1	
Q5	TRANSISTOR,GERMANIUM,PNP	910300004	49956	910300004	1	
Q6	TRANSISTOR,GERMANIUM PNP	910300008	56289	2N1728	1	
Q7	TRANSISTOR,GERMANIUM PNP	910300020	56289	910300020	1	
Q8	TRANSISTOR,GERMANIUM PNP	910300008	56289	2N1728	1	
Q9	TRANSISTOR,GERMANIUM PNP	910300020	56289	910300020	1	
R1	RESISTOR, FXD, COMPOSITION, 56KOHMS,1/4W, PORM 5 PCT	906900563	01121	CB	1	
R2	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R3	RESISTOR,FXD,COMPOSITION,100KOHMS,1/4W, PORM 5 PCT	906900104	82142	906900104	1	
R4	RESISTOR,FXD,COMPOSITION,470HMS,PORM 5 PCT,1/4W	906900470	01121	CB4705	1	
R5	RESISTOR, FXD, COMPOSITION, 6800 OHMS, 1/4W, PORM 5 PCT	906900682	01121	CB	1	
R6	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R7	RESISTOR,FXD,COMPOSITION,22KOHMS,1/4W, PORM 5 PCT	906900223	82142	906900223	1	
R8	RESISTOR,FXD,COMPOSITION,120KOHMS,1/4W, PORM 5 PCT	906900124	01121	CB	1	
R9	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R9	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R10	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R11	RESISTOR, FXD, COMPOSITION, 56000HMS, 1/4W, PORM 5 PCT	906900562	01121	CB	1	
R12	RESISTOR,FXD,COMPOSITION,22KOHMS,1/4W, PORM 5 PCT	906900223	82142	906900223	1	
R13	RESISTOR,FXD,COMPOSITION,5600HMS,1/4W, PORM 5 PCT	906900561	82142	906900561	1	
R14	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R15	RESISTOR,FXD,COMPOSITION,5600HMS,1/4W, PORM 5 PCT	906900561	82142	906900561	1	
R16	RESISTOR, FXD, COMPOSITION, 39 K OHMS, 1/4W, PORM 5 PCT	906900393	01121	CB	1	
R17	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R18	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R19	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R20	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R20	RESISTOR,FXD,COMPOSITION,8200 OHMS,1/4W, PORM 5 PCT	906900822	82142	906900822	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R21	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R22	RESISTOR,FXD,COMPOSITION,27000HMS,PORM 5 PCT,1/4 W	906900272	01121	CB2725	1	
R23	RESISTOR,FXD,COMPOSITION,2700HMS,1/4W, PORM 5 PCT	906900271	82142	906900271	1	
R24	RESISTOR,FXD,COMPOSITION,15000HMS,PORM 5 PCT, 1/4 W	906900152	01121	CB1525	1	
R26	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
R27	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R27	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R28	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R28	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R29	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R30	RESISTOR,FXD,COMPOSITION,8200 OHMS,1/4W, PORM 5 PCT	906900822	82142	906900822	1	
R31	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R32	RESISTOR,FXD,COMPOSITION,27000HMS,PORM 5 PCT,1/4 W	906900272	01121	CB2725	1	
R33	RESISTOR,FXD,COMPOSITION,2700HMS,1/4W, PORM 5 PCT	906900271	82142	906900271	1	
R34	RESISTOR,FXD,COMPOSITION,15000HMS,PORM 5 PCT, 1/4 W	906900152	01121	CB1525	1	
R35	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R36	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
R37	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R37	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R38	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R38	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ5	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ6	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ7	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ8	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ9	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ14	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XY1	SOCKET,	914200007	76487	33302	1	
XY2	SOCKET,	914200007	76487	33302	1	
Y1	CRYSTAL,2213.500 KHZ	912200028	94668	912200028	1	
Y2	CRYSTAL,2216.500 KHZ	912200029	94668	912200029	1	
	OSCILLATOR KHZ SUBASSEMBLY	A02063500	94668	A02063500		
	INCR.TUNING DIAL MECH.SUBASSEMBLY	A02062300	94668	A02062300	1	
	INCREMENTAL TUNING OSCILLATOR	B02001600	94668	B02001600	REF	
	SECOND L.F.AMPLIFIER	B02002000	94668	B02002000	REF	
	PHASE DISCRIMINATOR	B02002100	94668	B02002100	REF	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	LOW-PASS FILTER 125 KHZ	B02002200	94668	B02002200	REF	
	INCREMENTAL LOCK INDICATOR	B02002300	94668	B02002300	REF	
	FIRST L.F. AMPLIFIER	B02044400	94668	B02044400	REF	
	SECOND OSCILLATOR	B02044600	94668	B02044600	REF	
	INCREMENTAL REFERENCE AND MIXER	B02045000	94668	B02045000	REF	
	JACK,PHONE,INSULATED TIP,YELLOW NYLON	914400007	74970	105-607	1	
	CONNECTOR,SOLDER RECEPTACLE,MINIATURE	914600099	00779	329852	3	
	INCR.TUNING DIAL MECH.SUBASSEMBLY	A02062300	94668	A02062300		
	COVER,MODULATOR INDICATOR	B02004200	94668	B02004200	1	
	DRIVE WHEEL ASSEMBLY	B02004500	94668	B02004500	1	
	SHAFT VERNIER	B02004600	94668	B02004600	1	
	D WASHER	B02005000	94668	B02005000	1	
	GEAR DIAL DRIVE	B02005100	94668	B02005100	1	
	SPACER	B02005200	94668	B02005200	2	
	SPIRAL CAM AND DIAL MACHINING	B02053501	94668	B02053501	1	
	BACK PLATE MACHINING	D02009900	94668	D02009900	1	
	CAPACITOR,VARIABLE,AIR,5-75 PF	902810451	94668	902810451	1	
	O RING, 0.208 ID BY 0.070 W	911500034	94668	911500034	1	
	LAMP,INDICATOR,WITH SOCKET,GREEN BALL END CAP	913800023	94668	913800023	1	
	CONNECTOR,BNC,FEMALE	914600035	91737	UG-1094/U	1	
	KNOB,BROWN	916000091	94668	916000091	2	
	KNOB,BROWN,0.252 IN.DIA	916000092	13165	M12554	1	
	STOP RING,TUNING DIAL	917300222	94668	917300222	1	
	STOP RING,TUNING DIAL	917300223	94668	917300223	2	
	RING,RETAINING E RING,3/16 INCH SHAFT	917500005	79136	133-18	1	
	RING,RETAINING TRUARC,7/16 INCH SHAFT	917500024	79136	5100-43	2	
	RING,RETAINING	917500028	79136	5101-25	1	
	GEAR ASSEMBLY	917600046	94668	917600046	1	
	PLATE,CAL VERNIER	920400009	94668	920400009	1	
	INCREMENTAL TUNING OSCILLATOR	B02001600	94668	B02001600		
	SUPPORT,INDUCTOR	B01906700	94668	B01906700	1	
	PRINTED CIRCUIT BOARD	904500085	94668	904500085	1	
	RESISTOR,VARIABLE,20,000 OHMS,25 TURNS	907900181	81438	205-00	1	
C1	CAPACITOR,FXD,CERAMIC,10 PF,RADIAL LEAD	901430100	00656	CN-1	1	
C2	CAPACITOR,FXD,CERAMIC,39 PF,PORM 2 PCT	901420390	00656	CN-2	1	
C3	CAPACITOR,FXD,CERAMIC,150 PF,PORM 2 PCT,NPO	901400151	00656	CN-3	1	
C4	CAPACITOR,FXD,MICA,1500PF,PORM 5 PCT, 500VDCW	901900152	72136	DM19F-152J	1	
C5	CAPACITOR,FXD,CERAMIC,39 PF,PORM 2 PCT,NPO	901410390	00656	51-2	1	
C6	CAPACITOR,VARIABLE,GLASS PISTON,0.6-14 PF	903000120	73899	VC11G	1	
C7	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV10CN025COPN	1	
C8	CAPACITOR,FXD,MICA,4700PF,500V,PORM 5 PCT	901900472	72136	DM19F-472J	1	
C9	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C10	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C11	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
L1	INDUCTOR,VARIABLE,1.08MH	A01897300	94668	A01897300	1	
Q1	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
R1	RESISTOR,FXD,COMPOSITION,8200 OHMS,1/4W, PORM 5 PCT	906900822	82142	906900822	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R2	RESISTOR,FXD,COMPOSITION,82K OHMS,1/4W, PORM 5 PCT	906900823	01121	CB	1	
R3	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R4	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R5	RESISTOR,FXD,COMPOSITION,3900HMS,1/4W, PORM 5 PCT	906900391	82142	906900391	1	
R6	RESISTOR,FXD,COMPOSITION,100KOHMS,1/4W, PORM 5 PCT	906900104	82142	906900104	1	
R7	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	SECOND L.F.AMPLIFIER	B02002000	94668	B02002000		
	PRINTED CIRCUIT BOARD	904500096	94668	904500096	1	
	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	CLAMP,TRANSISTOR	916900019	94668	916900019	1	
C1	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C2	CAPACITOR,FXD,MICA,150PF,PORM 5 PCT, 500V	901900151	72136	DM15F-151J	1	
C3	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C4	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C5	CAPACITOR,FXD,MICA,120 PF,PORM 5 PCT, 500V	901900121	72136	DM15E-121J	1	
C6	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C7	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
L1	INDUCTOR, FXD, MOLDED, 82UH	909000124	99800	1537-72	1	
Q1	TRANSISTOR,SILICON PNP	910300066	07263	2N3644	1	
Q2	TRANSISTOR,GERMANIUM,PNP	910300004	49956	910300004	1	
R1	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R2	RESISTOR, FXD, COMPOSITION, 39 K OHMS, 1/4W, PORM 5 PCT	906900393	01121	CB	1	
R3	RESISTOR,VARIABLE,500 OHMS,PORM 20 PCT,3/10 W,LINEAR	907900174	71450	35370	1	
R4	RESISTOR,FXD,COMPOSITION,27000HMS,PORM 5 PCT,1/4 W	906900272	01121	CB2725	1	
R5	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R6	RESISTOR,FXD,COMPOSITION,39000HMS,1/4W, PORM 5 PCT	906900392	82142	906900392	1	
R7	RESISTOR,FXD,COMPOSITION,5600HMS,1/4W, PORM 5 PCT	906900561	82142	906900561	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	PHASE DISCRIMINATOR	B02002100	94668	B02002100		
	PRINTED CIRCUIT BOARD	904500092	94668	904500092	1	
C1	CAPACITOR,FXD,MICA,2000 PF,PORM 5 PCT, 500 V,DIPPED	901900202	72136	DM19-202J	1	
C2	CAPACITOR,FXD,MICA,2000 PF,PORM 5 PCT, 500 V,DIPPED	901900202	72136	DM19-202J	1	
C3	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C4	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C5	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C6	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C7	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C8	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
CR1	DIODE,SILICON	910500075	09133	1N4148	1	
CR2	DIODE,SILICON	910500075	09133	1N4148	1	
CR3	DIODE,GERMANIUM	910500003	31550	2N995	1	
CR4	DIODE,GERMANIUM	910500003	31550	2N995	1	
L1	INDUCTOR,500UH,VERTICAL,PRINTED CIRCUIT BOARD MOUNTING	A01920100	94668	A01920100	1	
R1	RESISTOR,FXD,COMPOSITION,390OHMS,1/4W, PORM 5 PCT	906900391	82142	906900391	1	
R2	RESISTOR,FXD,COMPOSITION,12000HMS,PORM 5 PCT,1/4 W	906900122	01121	CB1225	1	
R3	RESISTOR,VARIABLE,100K OHMS,PORM 20 PCT, 0.200W,LINEAR TAPER	907900179	94668	907900179	1	
R4	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R5	RESISTOR,VARIABLE,10KOHMS,1/4W,PORM 10 PCT, 25 TURNS	907900172	01121	RP103V	1	
R6	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
T1	TRANSFORMER	909900016	01961	PE5643	1	
T2	TRANSFORMER	909900017	01961	PE5667	1	
	LOW-PASS FILTER 125 KHZ	B02002200	94668	B02002200		
	PRINTED CIRCUIT BOARD	904500086	94668	904500086	1	
C1	CAPACITOR,VERTICAL MOUNTING,PLASTIC ENCASED 1.0 UF,25V N.P.	903300105	94668	903300105	1	
FL1	FILTER,LOW PASS	910100048	08307	28-1313	1	
R1	RESISTOR, FXD, COMPOSITION, 5600OHMS, 1/4W, PORM 5 PCT	906900562	01121	CB	1	
	INCREMENTAL LOCK INDICATOR	B02002300	94668	B02002300		
	CABLE ASSEMBLY	B01987604	94668	B01987604	1	
	PRINTED CIRCUIT BOARD	904500097	94668	904500097	1	
C1	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
C2	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C3	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C4	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C5	CAPACITOR,VERTICAL MOUNTING,PLASTIC ENCASED 1.0 UF,25V N.P.	903300105	94668	903300105	1	
CR1	DIODE,SILICON	910500010	49956	1N3604	1	
K1	RELAY,SINGLE POLE DOUBLE THROW 1500 OHMS, 5.8 MA,PRINTED CIRCUIT BOARD MOUNTING	912600026	78277	11FP-1500G-PAL	1	
Q1	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
Q2	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
Q3	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
R1	RESISTOR, FXD, COMPOSITION, 220 KOHMS, 1/4 W, PORM 5 PCT	906900224	01121	CB	1	
R2	RESISTOR,FXD,COMPOSITION,33000HMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	
R3	RESISTOR, FXD, COMPOSITION, 6800 OHMS, 1/4W, PORM 5 PCT	906900682	01121	CB	1	
R4	RESISTOR,FXD,COMPOSITION,12000HMS,PORM 5 PCT,1/4 W	906900122	01121	CB1225	1	
R5	RESISTOR,FXD,COMPOSITION,15000HMS,PORM 5 PCT, 1/4 W	906900152	01121	CB1525	1	
R6	RESISTOR,FXD,COMPOSITION, 1500HMS,1/4W, PORM 5 PCT	906900151	82142	906900151	1	
R7	RESISTOR, FXD, COMPOSITION, 18K OHMS, 1/4W, PORM 5 PCT	906900183	01121	CB	1	
R8	RESISTOR,FXD,COMPOSITION,8200 OHMS,1/4W, PORM 5 PCT	906900822	82142	906900822	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	FIRST L.F. AMPLIFIER	B02044400	94668	B02044400		
	PRINTED CIRCUIT BOARD	904500107	94668	904500107	1	
1	CLAMP,TRANSISTOR	916900019	94668	916900019	3	
C1	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C2	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C3	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C4	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C5	CAPACITOR,FXD,MICA,220PF,500V,PORM 5 PCT	901900221	72136	DM15F221J	1	
K1	RELAY,SINGLE POLE DOUBLE THROW 1500 OHMS, 5.8 MA,PRINTED CIRCUIT BOARD MOUNTING	912600026	78277	11FP-1500G-PAL	1	
L1	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
L2	INDUCTOR, FXD, MOLDED, 82UH	909000124	99800	1537-72	1	
Q1	TRANSISTOR,GERMANIUM PNP	910300008	56289	2N1728	1	
Q2	TRANSISTOR,GERMANIUM PNP	910300008	56289	2N1728	1	
Q3	TRANSISTOR,GERMANIUM,PNP	910300004	49956	910300004	1	
R1	RESISTOR,VARIABLE,20KOHMS,PORM 20 PCT, LINEAR	907900212	71450	39436	1	
R2	RESISTOR,FXD,COMPOSITION,22000HMS,1/4W, PORM 5 PCT	906900222	82142	906900222	1	
R3	RESISTOR, FXD, COMPOSITION, 39 K OHMS, 1/4W, PORM 5 PCT	906900393	01121	CB	1	
R4	RESISTOR,FXD,COMPOSITION, 1500HMS,1/4W, PORM 5 PCT	906900151	82142	906900151	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R5	RESISTOR, FXD, COMPOSITION, 56 OHMS, 1/4W, PORM 5 PCT	906900560	01121	CB	1	
R6	RESISTOR,FXD,COMPOSITION,39000HMS,1/4W, PORM 5 PCT	906900392	82142	906900392	1	
R7	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R8	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R9	RESISTOR,FXD,COMPOSITION,39000HMS,1/4W, PORM 5 PCT	906900392	82142	906900392	1	
R10	RESISTOR,FXD,COMPOSITION,4700HMS,1/4W, PORM 5 PCT	906900471	82142	906900471	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	INCREMENTAL REFERENCE AND MIXER	B02045000	94668	B02045000		
	SUPPORT,INDUCTOR	B01906700	94668	B01906700	1	
	PRINTED CIRCUIT BOARD	904500105	94668	904500105	1	
	CRYSTAL,18.585 MHZ	912200027	94668	912200027	1	
	CLIP,CRYSTAL HOLDING,STEEL	921100004	91506	8000-HP3	1	
C1	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C2	RESISTOR,FXD,COMPOSITION,22KOHMS,1/4W, PORM 5 PCT	906900223	82142	906900223	1	
C3	CAPACITOR,VARIABLE,CERAMIC,2-8PF,PC MTG	903200080	72982	538-011-89A	1	
C4	CAPACITOR,FXD,CERAMIC,100 PF,PORM 2 PCT,WPO	901420101	71590	TCZ100	1	
C5	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C6	CAPACITOR,FXD,CERAMIC,22 PF,PORM 2 PCT	901420220	00656	CN-1	1	
C7	CAPACITOR,FXD,CERAMIC,47 PF,PORM 2 PCT	901410470	71590	TCZ47	1	
C8	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C9	CAPACITOR,FXD,MICA,5 PF,PORM 10 PCT,500 V	901900050	72136	DM15-050K	1	
C10	CAPACITOR,VARIABLE,GLASS PISTON,0.8-8 PF PRINTED CIRCUIT BOARD MOUNTING	903000885	73899	VC9GWY	1	
C11	CAPACITOR,FXD,MICA,330 PF,PORM 5 PCT, 500V	901900331	72136	DM15F-331J	1	
C12	CAPACITOR,FXD,MICA,330 PF,PORM 5 PCT, 500V	901900331	72136	DM15F-331J	1	
C13	CAPACITOR,FXD,MICA,330 PF,PORM 5 PCT, 500V	901900331	72136	DM15F-331J	1	
C14	CAPACITOR,VARIABLE,GLASS PISTON,0.8-8 PF PRINTED CIRCUIT BOARD MOUNTING	903000885	73899	VC9GWY	1	
C15	CAPACITOR,FXD,MICA,330 PF,PORM 5 PCT, 500V	901900331	72136	DM15F-331J	1	
C16	CAPACITOR,FXD,MICA,330 PF,PORM 5 PCT, 500V	901900331	72136	DM15F-331J	1	
CR2	DIODE,SILICON	910500009	49956	MP-3507	1	
L1	INDUCTOR,FXD,MOLDED,24UH	909000121	94668	909000121	1	
L2	INDUCTOR,VARIABLE,GLASS,1.05UH	909400053	73899	LV5P102	1	
Q1	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
Q2					1	
R1	RESISTOR,FXD,COMPOSITION, 6800HMS,1/4W, PORM 5 PCT	906900681	82142	906900681	1	
R2	RESISTOR,FXD,COMPOSITION,150000HMS,PORM 5 PCT,1/4 W	906900153	01121	CB1535	1	
R4	RESISTOR,FXD,COMPOSITION,27000HMS,PORM 5 PCT,1/4 W	906900272	01121	CB2725	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R5	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R6	RESISTOR,FXD,COMPOSITION,2200HMS,PORM 5 PCT,1/4 W	906900221	01121	CB2215	1	
R7	RESISTOR,VARIABLE,500 OHMS,1/4W	907900102	01121	RS501M	1	
R8	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R9	RESISTOR,FXD,COMPOSITION,2200HMS,PORM 5 PCT,1/4 W	906900221	01121	CB2215	1	
R10	RESISTOR, FXD, COMPOSITION, 18000HMS, 1/4W, PORM 5 PCT	906900182	01121	CB	1	
R11	RESISTOR,FXD,COMPOSITION,150000HMS,PORM 5 PCT,1/4 W	906900153	01121	CB1535	1	
R12	RESISTOR, FXD, COMPOSITION, 18K OHMS, 1/4W, PORM 5 PCT	906900183	01121	CB	1	
R13	RESISTOR,FXD,COMPOSITION,4700HMS,1/4W, PORM 5 PCT	906900471	82142	906900471	1	
T1	TRANSFORMER	909900014	01961	PE5864	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XY1	SOCKET,	914200007	76487	33302	1	
	SECOND OSCILLATOR	B02044600	94668	B02044600		
	SUPPORT,INDUCTOR	B01906700	94668	B01906700	1	
	PRINTED CIRCUIT BOARD	904500106	94668	904500106	1	
	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
	TRANSISTOR,PNP	910300077	07263	2N3638A	1	
C15	CAPACITOR,FXD,PORCELAIN,15 PF,PORM 5 PCT, 500 V,AXIAL LEADS	901500150	94668	901500150	1	
R2	RESISTOR, FXD, COMPOSITION, 5600HMS, 1/4W, PORM 5 PCT	906900562	01121	CB	1	
R3	RESISTOR,FXD,COMPOSITION,120KOHMS,1/4W, PORM 5 PCT	906900124	01121	CB	1	
R4	RESISTOR,FXD,COMPOSITION,120KOHMS,1/4W, PORM 5 PCT	906900124	01121	CB	1	
R5	RESISTOR,FXD,COMPOSITION, 6800HMS,1/4W, PORM 5 PCT	906900681	82142	906900681	1	
R6	RESISTOR,FXD,COMPOSITION,3900HMS,1/4W, PORM 5 PCT	906900391	82142	906900391	1	
R7	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R8	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R9	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R10	RESISTOR,FXD,COMPOSITION,1800HMS,1/4W, PORM 5 PCT	906900181	01121	CB	1	
R11	RESISTOR,FXD,COMPOSITION,27KOHMS,1/4W, PORM 5 PCT	906900273	82142	906900273	1	
R12	RESISTOR,FXD,COMPOSITION,27KOHMS,1/4W, PORM 5 PCT	906900273	82142	906900273	1	
R13	RESISTOR,FXD,COMPOSITION,33000HMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
	MAIN TUNING OSCILLATOR SUBASSEMBLY	A02063600	94668	A02063600		
	MAIN TUNING DIAL MECH.SUBASSEMBLY	A02062200	94668	A02062200	1	
	CABLE ASSEMBLY	B01987602	94668	B01987602	1	
	100KHZ OSCILLATOR AND HARMONIC GENERATOR	B02002600	94668	B02002600	REF	
	MAIN TUNING MIXER	B02002700	94668	B02002700	REF	
	AMPLIFIER-DETECTOR	B02002800	94668	B02002800	REF	
	50-KHZ INPUT LOWPASS FILTER	B02002900	94668	B02002900	REF	
	50-KHZ OUTPUT LOWPASS FILTER	B02003000	94668	B02003000	REF	
	MAIN LOCK INDICATOR	B02003100	94668	B02003100	REF	
	8-FILTER	B02003200	94668	B02003200	REF	
	MAIN TUNING FOLLOWER	B02044800	94668	B02044800	REF	
	JACK,PHONE,INSULATED TIP,YELLOW NYLON	914400007	74970	105-607	1	
	CONNECTOR,SOLDER RECEPTACLE,MINIATURE	914600099	00779	329852	6	
	MAIN TUNING DIAL MECH.SUBASSEMBLY	A02062200	94668	A02062200		
	DRIVE WHEEL ASSEMBLY	B02004500	94668	B02004500	1	
	SHAFT VERNIER	B02004600	94668	B02004600	1	
	GEAR DIAL DRIVE	B02005100	94668	B02005100	1	
	SPACER	B02005200	94668	B02005200	1	
	PLATE CAPACITOR MOUNTING	B02008500	94668	B02008500	1	
	SPIRAL COM AND DIAL MACHINING	B02053500	94668	B02053500	1	
	CALIBRATION VERNIER	C02004101	94668	C02004101	1	
	BACK PLATE MACHINING	D02009901	94668	D02009901	1	
	CAPACITOR,VARIABLE,AIR	902810750	80538	9420-17-10003	1	
	O RING, 0.208 ID BY 0.070 W	911500034	94668	911500034	1	
	LAMP,INDICATOR,WITH SOCKET,GREEN BALL END CAP	913800023	94668	913800023	1	
	CONNECTOR,BNC,FEMALE	914600035	91737	UG-1094/U	1	
	KNOB,BROWN	916000091	94668	916000091	2	
	KNOB,BROWN,0.252 IN.DIA	916000092	13165	M12554	1	
	STOP RING,TUNING DIAL	917300222	94668	917300222	1	
	STOP RING,TUNING DIAL	917300223	94668	917300223	2	
	RING,RETAINING E RING,3/16 INCH SHAFT	917500005	79136	133-18	1	
	RING,RETAINING TRUARC,7/16 INCH SHAFT	917500024	79136	5100-43	2	
	RING,RETAINING	917500028	79136	5101-25	1	
	GEAR ASSEMBLY	917600046	94668	917600046	1	
	MASK INDICATOR	920400008	94668	920400008	1	
	100KHZ OSCILLATOR AND HARMONIC GENERATOR	B02002600	94668	B02002600		
	PRINTED CIRCUIT BOARD	904500098	94668	904500098	1	
C1	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
C2	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C3	CAPACITOR,VARIABLE,GLASS PISTON,0.8-8 PF PRINTED CIRCUIT BOARD MOUNTING	903000885	73899	VC9GWY	1	
C4	CAPACITOR,FXD,MICA,22PF,500V,PORM 5 PCT	901900220	72136	DM15C220J	1	
C5	CAPACITOR,FXD,MICA,1500PF,PORM 5 PCT, 500VDCW	901900152	72136	DM19F-152J	1	
C6	CAPACITOR,FXD,MICA,560PF,PORM 5 PCT,300VDCW	901900561	72136	DM15F-561J	1	
C7	CAPACITOR,FXD,MICA,5600 PF,PORM 5 PCT 300 V,DIPPED	901900562	72136	DM19-562J	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
C8	CAPACITOR,FXD,MICA,330 PF,PORM 5 PCT, 500V	901900331	72136	DM15F-331J	1	
C9	CAPACITOR,FXD,MICA,18PF,PORM 5 PCT, 500V	901900180	72136	DM15C-180J	1	
C10	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
C11	CAPACITOR,FXD,MICA,100PF,PORM 5 PCT,500VDCW	901900100	72136	DM15F-100J	1	
L1	INDUCTOR,VARIABLE,2.5MH	A01897200	94668	A01897200	1	
L2	INDUCTOR, FXD, MOLDED, 82UH	909000124	99800	1537-72	1	
Q1	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
Q2	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
Q3	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
Q4	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
R1	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R2	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R3	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R4	RESISTOR,FXD,COMPOSITION, 82 OHMS,1/4W, PORM 5 PCT	906900820	82142	906900820	1	
R5	RESISTOR, FXD, COMPOSITION, 6800 OHMS, 1/4W, PORM 5 PCT	906900682	01121	CB	1	
R6	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R7	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/2W	905000102	01121	EB1-2-102J	1	
R8	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R9	RESISTOR, FXD, COMPOSITION, 56000HMS, 1/4W, PORM 5 PCT	906900562	01121	CB	1	
R10	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/2W	905000102	01121	EB1-2-102J	1	
R11	RESISTOR, FXD, COMPOSITION, 68 OHMS, 1/4W, PORM 5 PCT	906900680	01121	CB-680J	1	
R12	RESISTOR,FXD,COMPOSITION, 47K OHMS, 1/4W, PORM 5 PCT	906900473	01121	CB	1	
R13	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R14	RESISTOR,FXD,COMPOSITION,33000HMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ4	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
Y1	CRYSTAL,100.00 KHZ WITH WIRE LEADS	912200030	94668	912200030	1	
	MAIN TUNING MIXER	B02002700	94668	B02002700		
	CABLE ASSEMBLY	B01987605	94668	B01987605	1	
	PRINTED CIRCUIT BOARD	904500100	94668	904500100	1	
C1	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C2	CAPACITOR,FXD,MICA,100 PF,PORM 5 PCT, 500V	901900101	72136	DM15F-101J	1	
C3	CAPACITOR,VARIABLE,CERAMIC,2-8PF,PC MTG	903200080	72982	538-011-89A	1	
C4	CAPACITOR,FXD,MICA,220PF,500V,PORM 5 PCT	901900221	72136	DM15F221J	1	
C5	CAPACITOR,FXD,MICA,330 PF,PORM 5 PCT, 500V	901900331	72136	DM15F-331J	1	
C6	CAPACITOR,FXD,MICA,330 PF,PORM 5 PCT, 500V	901900331	72136	DM15F-331J	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
C7	CAPACITOR,FXD,MICA,5 PF,PORM 10 PCT,500 V	901900050	72136	DM15-050K	1	
C8	CAPACITOR,VARIABLE,CERAMIC,2-8PF,PC MTG	903200080	72982	538-011-89A	1	
C9	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
CR1	DIODE,GERMANIUM	910500003	31550	2N995	1	
CR2	DIODE,HOT-CARRIER	910500069	28480	5082-2900	1	
CR3	DIODE,HOT-CARRIER	910500069	28480	5082-2900	1	
Q1	TRANSISTOR,GERMANIUM PNP	910300017	56289	2N2360	1	
R1	RESISTOR,FXD,COMPOSITION,47000HMS,1/4W, PORM 5 PCT	906900472	82142	906900472	1	
R2	RESISTOR,FXD,COMPOSITION,150000HMS,PORM 5 PCT,1/4 W	906900153	01121	CB1535	1	
R3	RESISTOR,FXD,COMPOSITION,5600HMS,1/4W, PORM 5 PCT	906900561	82142	906900561	1	
R4	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R5	RESISTOR,FXD,COMPOSITION,2200HMS,PORM 5 PCT,1/4 W	906900221	01121	CB2215	1	
R6	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R7	RESISTOR,FXD,COMPOSITION,10KOHMS,1/4W, PORM 5 PCT	906900103	82142	906900103	1	
R8	RESISTOR,FXD,COMPOSITION,2200HMS,PORM 5 PCT,1/4 W	906900221	01121	CB2215	1	
R9	RESISTOR,FXD,COMPOSITION,2200HMS,PORM 5 PCT,1/4 W	906900221	01121	CB2215	1	
R10	RESISTOR,VARIABLE,500 OHMS,PORM 20 PCT,3/10 W,LINEAR	907900174	71450	35370	1	
R11	RESISTOR,FXD,COMPOSITION,120HMS,PORM 5 PCT, 1/4 W	906900120	01121	CB1205	1	
R12	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
T1	TRANSFORMER	909900014	01961	PE5864	1	
XQ1	SOCKET-TRANSISTOR,4 PIN	914200037	81073	22-16-4	1	
	AMPLIFIER-DETECTOR	B02002800	94668	B02002800		
	CABLE ASSEMBLY	B01987600	94668	B01987600	1	
	CLAMP,TRANSISTOR	916900019	94668	916900019	1	
C1	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C2	CAPACITOR,NON-POLAR 10 UF MINUS 10 PCT PLUS 100 PCT, 25V	903300106	76055	MTV100N025C0PN	1	
C3	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C4	CAPACITOR,FXD,MICA,1200 PF,PORM 5 PCT, 500V,DIPPED	901900122	72136	DM19-122J	1	
C5	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C6	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
L1	INDUCTOR,FXD,8.1MH	A01897500	94668	A01897500	1	
L2	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
Q1	TRANSISTOR,PNP	910300077	07263	2N3638A	1	
Q2	TRANSISTOR,PNP	910300077	07263	2N3638A	1	
Q3	TRANSISTOR,GERMANIUM,PNP	910300004	49956	910300004	1	
R1	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R2	RESISTOR, FXD, COMPOSITION, 39 K OHMS, 1/4W, PORM 5 PCT	906900393	01121	CB	1	
R3	RESISTOR,FXD,COMPOSITION,33000HMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
R4	RESISTOR,FXD,COMPOSITION,22KOHMS,1/4W, PORM 5 PCT	906900223	82142	906900223	1	
R5	RESISTOR, FXD, COMPOSITION, 39 K OHMS, 1/4W, PORM 5 PCT	906900393	01121	CB	1	
R6	RESISTOR,FXD,COMPOSITION,27000HMS,PORM 5 PCT,1/4 W	906900272	01121	CB2725	1	
R7	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R8	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R9	RESISTOR,FXD,COMPOSITION,39000HMS,1/4W, PORM 5 PCT	906900392	82142	906900392	1	
R10	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
R11	RESISTOR, FXD, COMPOSITION, 22 OHMS, 1/4W, PORM 5 PCT	906900220	01121	CB	1	
R12	RESISTOR,FXD,COMPOSITION,470HMS,PORM 5 PCT,1/4W	906900470	01121	CB4705	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XW3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	50-KHZ INPUT LOWPASS FILTER	B02002900	94668	B02002900		
	PRINTED CIRCUIT BOARD	904500101	94668	904500101	1	
C1	CAPACITOR,FXD,MICA,560PF,PORM 5 PCT,300VDCW	901900561	72136	DM15F-561J	1	
C2	CAPACITOR,FXD,MICA,150PF,PORM 5 PCT, 500V	901900151	72136	DM15F-151J	1	
C3	CAPACITOR,FXD,MICA,1200 PF,PORM 5 PCT, 500V,DIPPED	901900122	72136	DM19-122J	1	
L1	INDUCTOR,FXD,16.9MH	A01921300	94668	A01921300	1	
	50-KHZ OUTPUT LOWPASS FILTER	B02003000	94668	B02003000		
	CABLE ASSEMBLY	B01987602	94668	B01987602	1	
	PRINTED CIRCUIT BOARD	904500095	94668	904500095	1	
C1	CAPACITOR,FXD,MICA,680PF,PORM 5 PCT,300VDCW	901900681	72136	DM15F-681J	1	
C2	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
L1	INDUCTOR,FXD,23MH	A01897600	94668	A01897600	1	
L2	INDUCTOR,FXD,MOLDED,24UH	909000121	94668	909000121	1	
R1	RESISTOR,FXD,COMPOSITION,39000HMS,1/4W, PORM 5 PCT	906900392	82142	906900392	1	
R2	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
	MAIN LOCK INDICATOR	B02003100	94668	B02003100		
	PRINTED CIRCUIT BOARD	904500091	94668	904500091	1	
C1	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C2	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
C3	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C4	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C5	CAPACITOR,FXD,ELECTROLYTIC,1MF,PORM 10, 50 VDCW	902760105	82484	CS13BG105K	1	
CR1	DIODE,SILICON	910500010	49956	1N3604	1	
Q1	TRANSISTOR,SILICON,NPN	910300024	07263	2N706B	1	
Q2	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
Q3	TRANSISTOR,SILICON,NPN	910300022	04713	2N706A	1	
R1	RESISTOR, FXD, COMPOSITION, 220 KOHMS, 1/4 W, PORM 5 PCT	906900224	01121	CB	1	
R2	RESISTOR,FXD,COMPOSITION,3300OHMS,PORM 5 PCT,1/4 W	906900332	01121	CB3325	1	
R3	RESISTOR, FXD, COMPOSITION, 6800 OHMS, 1/4W, PORM 5 PCT	906900682	01121	CB	1	
R4	RESISTOR,FXD,COMPOSITION,12000HMS,PORM 5 PCT,1/4 W	906900122	01121	CB1225	1	
R5	RESISTOR,FXD,COMPOSITION,15000HMS,PORM 5 PCT, 1/4 W	906900152	01121	CB1525	1	
R6	RESISTOR,FXD,COMPOSITION, 1500HMS,1/4W, PORM 5 PCT	906900151	82142	906900151	1	
R7	RESISTOR, FXD, COMPOSITION, 18K OHMS, 1/4W, PORM 5 PCT	906900183	01121	CB	1	
R8	RESISTOR,FXD,COMPOSITION,8200 OHMS,1/4W, PORM 5 PCT	906900822	82142	906900822	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ2	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
XQ3	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	
	B-FILTER	B02003200	94668	B02003200		
	PRINTED CIRCUIT BOARD	904500093	94668	904500093	1	
C1	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C2	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
C3	CAPACITOR,NON-POLAR,22 UF,MINUS 10 PCT PLUS 100 PCT 25V	903300226	76055	MTV220N025C0SN	1	
C4	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C5	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
L1	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
L2	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
L3	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
L4	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
	MAIN TUNING FOLLOWER	B02044800	94668	B02044800		
	PRINTED CIRCUIT BOARD	904500212	94668	904500212	1	
C1	CAPACITOR,FXD,MICA, 750 PF,PORM 5 PCT, 300 V,DIPPED	901900751	72136	DM15-751J	1	
C2	CAPACITOR,FXD,CERAMIC,0.1MFD,100V,PORM 20 PCT	901410104	56289	33C41B6	1	
C3	CAPACITOR,VERTICAL MOUNTING,PLASTIC ENCASED 1.0 UF,25V N.P.	903300105	94668	903300105	1	

REF DESIG	DESCRIPTION	SIERRA PART NUMBER	FMC	DRAWING NO. OR MFG NO.	QTY	EFFECTIVITY CODE
C4	CAPACITOR,FXD,MICA,5 PF,PORM 10 PCT,500 V	901900050	72136	DM15-050K	1	
C5	CAPACITOR,CERAMIC DISC,0.01UF,PLUS 60 PCT, MINUS 40 PCT,150V	901440103	12289	DOM-103	1	
K1	RELAY,REED,18V,200000 OHMS,PORM 10 PCT, PRINTED CIRCUIT BOARD MOUNTING	912600051	94668	912600051	1	
L1	INDUCTOR,FXD,MOLDED,6800H	909000122	94668	909000122	1	
L2	INDUCTOR,FXD,RF3.3MH PORM 10 PCT	909000116	76493	70F333A1	1	
Q1	TRANSISTOR	910300044	07263	2N3641	1	
R1	RESISTOR,FXD,COMPOSITION,12KOHMS,1/4W, PORM 5 PCT	906900123	82142	906900123	1	
R2	RESISTOR,FXD,COMPOSITION,330000HMS,PORM 5 PCT,1/4 W	906900333	01121	CB3335	1	
R3	RESISTOR,FXD,COMPOSITION,10000HMS,PORM 5 PCT,1/4 W	906900102	01121	CB1025	1	
R4	RESISTOR, FXD, COMPOSITION, 68 OHMS, 1/4W, PORM 5 PCT	906900680	01121	CB-680J	1	
R5	RESISTOR,FXD,COMPOSITION,1000HMS,1/4W, PORM 5 PCT	906900101	82142	906900101	1	
XQ1	SOCKET,TRANSISTOR,3 PIN	914200036	81073	22-16-3	1	

Warranty

SIERRA ELECTRONIC OPERATION, PHILCO-FORD CORPORATION warrants products manufactured by it to be free from defects in material and workmanship and to meet the applicable specifications under normal use and service for a period of 12 months from the date of original shipment by us. Our obligation under this warranty is limited to the repair or replacement of such products which, after having been returned to the factory or a point designated by us, shall be examined and in our sole opinion, found defective and that such defect was not induced by causes external to the product. Alternately, SIERRA may elect to issue credit for any such defective product.

All products to be repaired or replaced shall be returned prepaid to the designated place of repair in accordance with authorization and packing and shipping instructions issued by SIERRA. Return shall not be made until such authorization and instructions are issued. Each returned product shall be accompanied by a statement or report fully stating the claimed defects and any other pertinent information concerning the failure.

SIERRA'S responsibility under this warranty does not apply to any products which have been repaired, worked upon or altered by persons not authorized by us so as to in our sole judgement, injure the stability or reliability of such product, or which have been subject to misuse, negligence or accident, or where applicable, the serial number has been altered, effaced or removed. SIERRA shall not be liable for damages resulting from the use of the purchased product, nor shall SIERRA be responsible for any failure in the performance of other items to which the purchased product is connected or the functioning of an entire system or parts of any system of which the purchased product may be a part.

SIERRA reserves the right to make changes in the design or construction of any of its products at any time without incurring any obligation to make changes whatever on units previously purchased. Accessories, including but not limited to all vacuum tubes, fuses, pilot lamps and batteries used with our products are not covered by this warranty. A test setup charge of $25.00 will apply to any returned instrument or microwave component which, after test, is found to meet the applicable specifications.

This warranty is in lieu of all other warranties, expressed, implied or statutory. No representative or person is authorized to represent nor assume for SIERRA any liability in connection with the sale of products other than set forth herein. IN NO EVENT SHALL SIERRA BE LIABLE FOR SPECIAL INCIDENTAL OR CONSEQUENTIAL DAMAGES.